Vol. 19. No. 6 JUNE, 1921

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Entered as second class matter February 10, 1903, at the post-office at New York under the Act of 1879.

A MONTHLY PUBLICATION RELATING TO THE METAL AND PLATING TRADES

SUBSCRIPTION PRICE PER YEAR, UNITED STATES AND CANADA, ONE DOLLAR; OTHER COUNTRIES, TWO DOLLARS. THE METAL INDUSTRY PUBLISHING COMPANY, 99 JOHN STREET, NEW YORK

THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW.

Vol. 19 NEW YORK, JUNE, 1921 No. 6

American Electro-Platers' Society Convention

A Description of the Plating Industry of Indianapolis, Ind., the Convention City

Written for The Metal Industry by EARL BULLOCK

When electro-platers from all parts of the United States visit Indianapolis on the occasion of the Eighth Annual Convention of the American Electro-Platers Society, June 29-30 and July 1 and 2, they will be able to visit, not the most plants in any city in the country, but some of the most unique work being done that it would be possible to see in any one city in the country. The Indianapolis Branch of the American Electro-Platers Society does not claim for Indianapolis that the greatest volume of work is being done here, but they do claim that when quality and diversity of work is considered the city will not be far behind any of its larger sisters.

THE CLAYPOOL HOTEL, WHERE WILL BE HELD REGISTRATION, ALL BUSINESS SESSIONS AND THE BANQUET.

HISTORY OF PLATING IN INDIANAPOLIS

The history of the electro-plating industry here is somewhat veiled in mystery. From what can be remembered by some of the foremost men in the industry, it appears that the electro-plating business just naturally grew up without any one to chronicle its birth or early childhood. Some of the old timers can remember when C. F. Smith started a bicycle factory in 1888 and the real history of the electro-plating business dates from that time. Before this it is known that a roller skate manufacturing plant did some electro-plating, but the plant went out of business before the department was well developed. Then, before that when a body of Indianapolis business men organized a little company for the purpose of making shakers—you know the sort of shakers meant—those used behind long mahogany bars before Senator Volstead became publicly popular and privately unpopular—a department for electro-plating was started in the plant. But after a short industrial life, the owners of the plant evidently foresaw the passage of the Eighteenth amendment and went out of business. Those were the prehistoric times so far as the electro-plating industry is concerned.

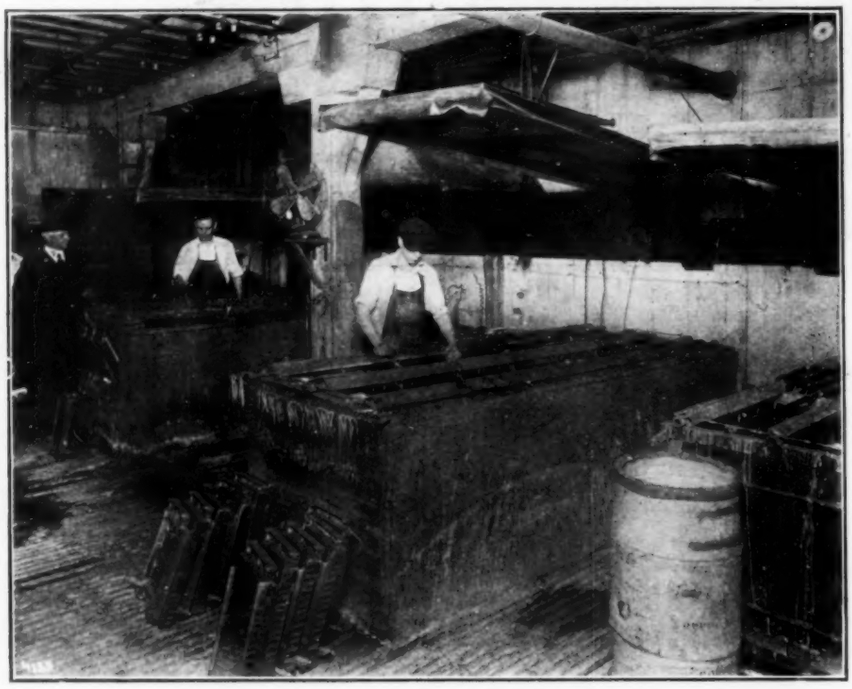
Electro-plating really came into its own when the bicycle ceased to be generally used and the automobile came into use. The Nordyke & Marmon Company here had long been engaged in the manufacture of milling machinery and soon after it became certain that the automobile was practical they began experimenting in the manufacture of the now nationally known Marmon car. From the first Walter Marmon, who succeeded his father, the founder of the company, was interested in the automobile production of the business. High grade automobiles need a lot of electro-plating and this department has been developed along with the automobile development so that now the company has one of the largest departments in the city.

MUCH JOB-PLATING DONE

Right here it might be well to say that Indianapolis is primarily a field for the job plater. With all its high grade automobile factories, each of which is a large user of electro-plating, the Marmon Company is the only one that maintains a separate department. The remainder all depend on the job platers for their work. Officials of some of these plants declare that in a job shop they can get just as good work at prices that are lower when figured over a year's work than the same work would cost in a special department of the plant. This probably accounts for the fact that some of the job shops of the city are highly developed.

A vast amount of work is thrown the job shops by such companies as the Stutz Fire Engine Company, the National Motor Vehicle Company, the Cole Motor Car Company, the Lafayette Motors Corporation, the Premier Motor Car Company, the Stutz Motor Car Company, the William Small Company, makers of the Monroe, and the Duesenberg Company. During the last six or nine

months the volume of work from these plants has, of course, fallen off, but since the opening of the spring season the tendency has been to increase production and with no exception the production schedules in every automobile factory in the city show increases each month over the month before.



A VIEW OF THE CLIMAX MACHINERY COMPANY'S PLATING DEPARTMENT WITH C. H. PROCTOR, FOUNDER OF THE A. E. S. AND PLATING-CHEMICAL EDITOR OF THE METAL INDUSTRY, ON THE LEFT BACKGROUND.

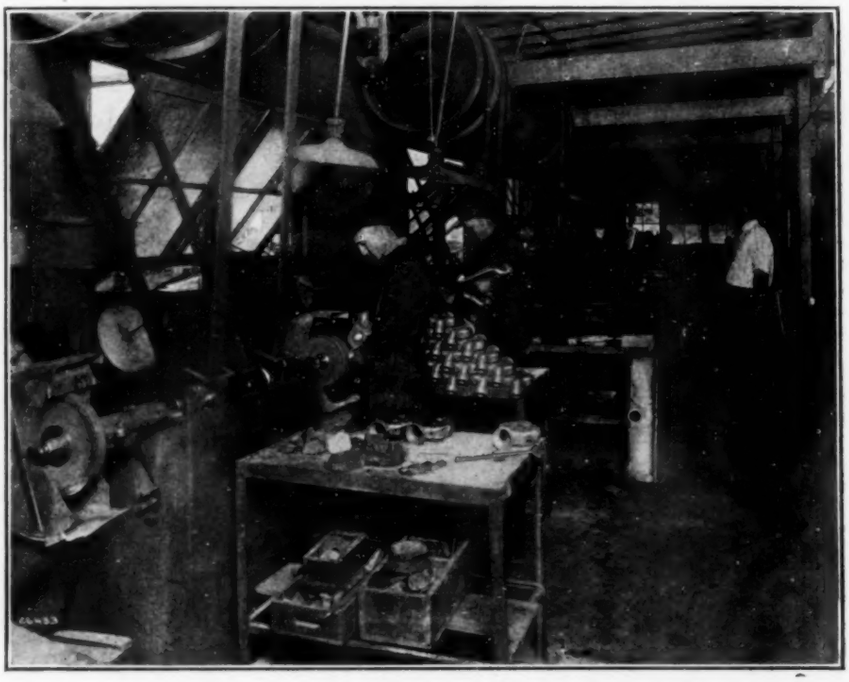
The job plants here are also getting considerable work from the automobile body plants. The Robbins Body Corporation and the Millspaugh & Irish Company, both makers of high grade enclosed bodies for automobiles, patronize the job plants. Neither of these corporations maintains a separate electroplating department and the tendency especially for bodies of the better class, including limousines, coupes and the like, is for more bright work. Production in these plants also has been curtailed, but is showing signs of improvement.

ACCOMMODATION FOR DELEGATES

With regard to the convention itself, the Indianapolis branch is devoting much time to educational work. What the Indianpolis branch wants is a convention that will get down to "brass tacks" and be of such educational value to the industry that each person who attends will go home feeling that the time and money were well spent. Not that there will not be entertainment features plenty, but the plan is to start the sessions on time, end on time and crowd each minute of the business sessions with something of real value. The local branch was organized in 1912 with twelve active members. It now has a membership of twenty-three more active members. Each member of the branch has a particular job to do during the convention and pre-convention days, and his wife, if he has one, also has a job cut out for herself.

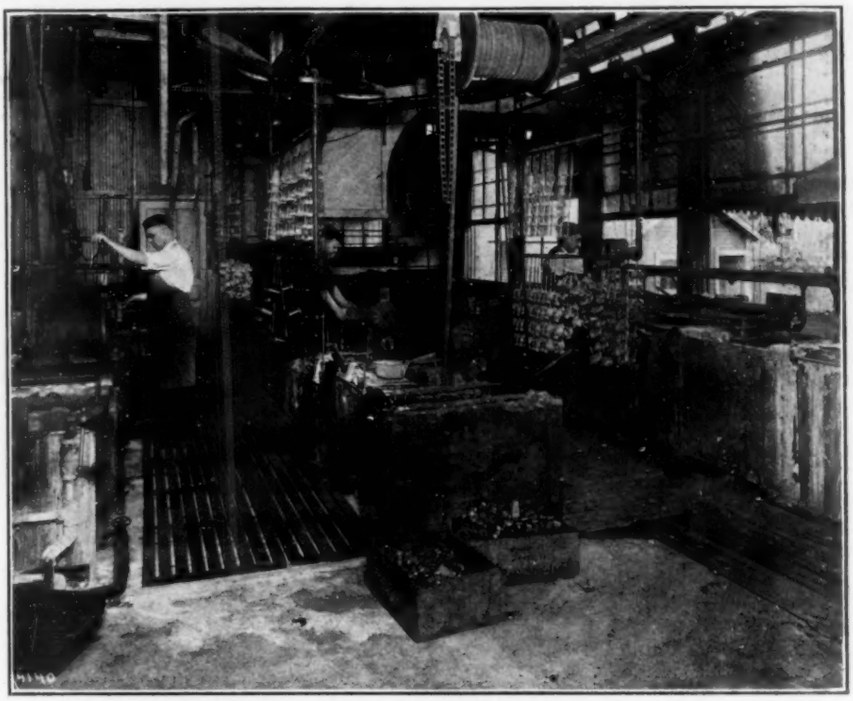
All the sessions of the convention will be held in the Claypool hotel. The hotel is equipped with an assembly room on the eighth floor that will take care of all the business sessions and the local branch has leased the remainder of the floor for the four days to handle the exhibits. George Barrows, who is chairman of the committee on exhibits, publicity and program, has announced that exhibition spaces will be free to the members who desire to exhibit their own work. A display charge will be made to commercial houses who sell to the trade. Numerous reservations for space already have been made and Mr. Barrows declares that from the advance requests for space, the exhibits will be more numerous than at any other previous convention.

Delegates from out of town all will arrive in the Union Station. From this point it is just three short squares to the hotel. At the registration booths, which will be located in the hotel lobby, will be persons who will be able to give any desired information



A VIEW OF THE ELECTRO-PLATING DEPARTMENT OF THE NORDYKE & MARMON COMPANY, MANUFACTURERS OF AUTOMOBILES.

concerning rooms, points of interest, etc. Indianapolis has ample hotel facilities for handling conventions much larger in size, so there will be no question of securing rooms. Within a radius of four blocks from the Claypool are four large hotels and about fifteen smaller ones, all with good accommodations. Rates on the European plan run from $3 a day to $7, depending upon the hotel and whether bath is desired. The Indianapolis branch is asking that each delegate report to the registration booth at the Claypool hotel just as soon as he arrives in the city in order that he may be assigned without loss of time to his hotel. In addition to this the registrant will be given all the necessary tickets, badges and appurtenances, including the general program that go with the business and entertainment features of the program.



THE WHEELER-SCHEBLER CARBURETOR COMPANY HAS A LARGE ELECTRO-PLATING DEPARTMENT.

RAILROAD ARRANGEMENTS

Members of the committee on transportation, of which James Walsh is chairman, are yet working on the question of reduced fares for the convention. The question has been taken up with the national secretary, and so far as the local committee is concerned, all the work has been done. Mr. Walsh is confident that reduced fares will prevail and that at least thirty days' notice may be given the delegates. The local committee plans a reduction in fare to equal about fare and one-half for the round trip on the certificate plan. The plan will take care of the families also. Arrangements are being made to have this plan in effect on all roads operated by members of the Trunk Line Association, Southwestern Association, Central Association, Western Association and Southeastern Association. Delegates from New England likely will have to pay full fare or buy tickets to New Albany or New York City and then take advantage of the reduced fare. The New England Association will not make reduced rates at all.

A VIEW OF THE INDIANAPOLIS PLATING COMPANY, ONE OF THE LARGE PLANTS THAT MAKES A SPECIALTY OF ELECTRO-PLATING.

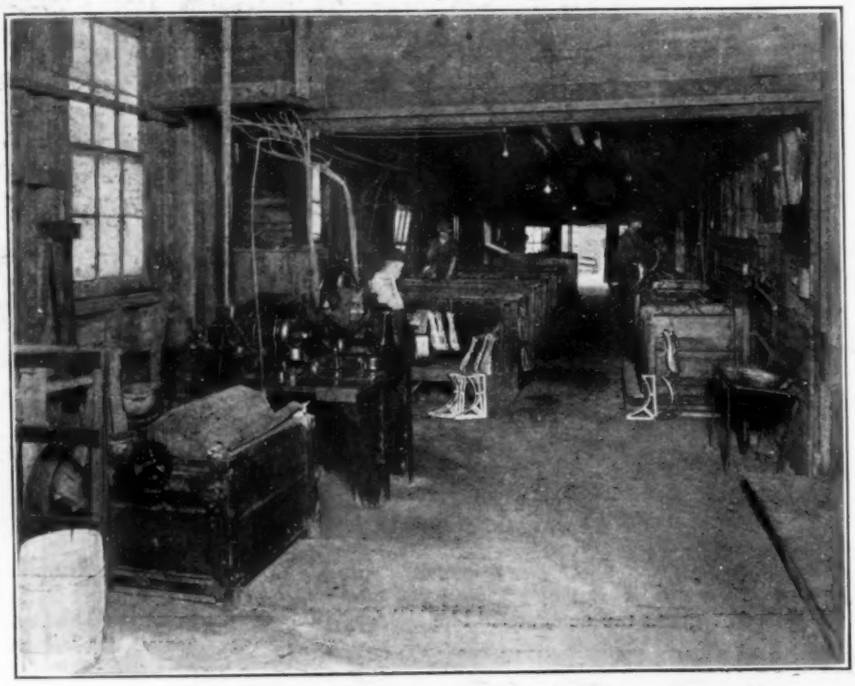
In case the certificate plan is put through, it will be necessary for the delegate to secure a certificate from the agent selling the ticket. This is not a receipt, but a certificate that must be signed by the endorsing officer at the convention and validated by a special agent of the railroad company before any advantage can be taken of the reduced fare. Buy a ticket only to the destination, as the certificate properly signed and validated, takes care of the return trip and gives the reduction.

It will be necessary to have at least 350 certificates in order to secure this dispensation on the part of the railroads. If the necessary minimum is presented to the special agent of the roads and the individual holder's certificate is duly validated, then the holder is entitled to return over the same road he came over at one-half the fare of the original trip.

Officials of the committee are arranging with the Transcontinental Passenger Association for summer excursion rates from principal stations in California, Nevada, Oregon, Washington and other similar places to eastern destinations on the basis of approximately one and one-third fares for the round trip journey.

LOCAL ELECTRO-PLATING PLANTS

With regard to the various electro-plating departments, the E. C. Atkins Company, saw manufacturers, have one of the large departments here. The department is in charge of J. F. Thompson and is virtually as old as the factory itself. The company was started sixty-five years ago when Indiana was densely covered with hardwood timber. It began in a small way to manufacture saws for the purpose of cutting off this timber. The company has grown until now it manufactures saws for every purpose. It makes circular saws of all sizes, band saws, saws for use in paper mills, saws for use in meat shops and hack saws; in fact, every business that has need for a saw can be supplied. Most of the plating work is done on handles, frames and meat saws.



THE INDIANAPOLIS STOVE COMPANY, WHICH MANUFACTURES HIGH-GRADE HEATING AND COOK STOVES MAINTAINS AN ELECTRO-PLATING DEPARTMENT.

When your office boy goes to the post office to get the mail in the morning, in case you do not wait for the carrier, he doubtless gets the mail out of a box that was manufactured and plated in Indianapolis by the Keyless Lock Company. The company has been in business more than thirty-five years and always has manufactured lock boxes for post offices exclusively. Most of the work done in the department is oxidizing, but considerable nickel is used on the front of the box.

William Prater is the presiding genius in the electro-plating department of the Holcomb & Hoke Manufacturing Company, a company that manufactures automatic popcorn and peanut roasting machines. The company has been manufacturing these combination machines, which are sold to drug stores, confectioneries and the like, for about eight years and during that time has built up an export business in England, France, Italy, Japan, Canada, Mexico, and virtually all the South American countries. Much electro-plating is done during the manufacture of the machine. It must go into nice places and must be decorative, so nickel plating is used on practically all the visible metal portions with the exception of the electric popper. In addition the company is now putting out a new salted peanut container that is heavily plated. It is doubtful if in the entire country there is a more interesting plant. The machine as finally completed is a work of mechanical art. It is almost human in its functioning and officials of the company say that in spite of the fact that it costs more than $1,000 set down in any store, it will pay for itself and make a good return if properly located. The first time the machine was ever shown in Liverpool it was set up in a drug store window and such a mob collected around it that the police made the proprietors move it back to the rear of the store.

Richard Hennessy, president of the Indianapolis Branch of the American Electro-Platers' Society, is head of the plating department of the Climax Machinery Company. This is an interesting company which manufactures meat slicing machines. The butcher, by means of a little screw, can slice meat so thin you can read a paper through it. The company does a lot of electro-plating on these machines and maintains a large department.

In addition to discharging his duties as secretary-treasurer of the Indianapolis branch, Louis Mertz spends some of his time down at the plant of the Wheeler-Schebler Carburetor Company. The company makes just what its name implies. It has been making them for ten years and uses all its large electro-plating plant exclusively for plating its own manufactured product. The electro-plating department is large in production, though small where numbers alone are considered because of the fact that virtually all its equipment is automatic. The company has designed some of the equipment for the department in its own engineering department and has installed these labor-saving machines. It is equipped with electro-cleaners that are all but automatic, agitators and a large cleaner that is exclusively the idea of the company itself. Regardless of what is to be said about the automobile business and production in that line, officials of this company say they have no complaint.

If you ever in your school days belonged to the orchestra, or better still if you ever have sat in a theater and watched how the trap drummer managed to keep his noise-making instruments separated and ready for instant use, you doubtless have wondered where in thunder he got them all. This mystery will be solved if you attend the convention and visit the plant of the Leedy Manufacturing Company, one of the largest drum and accessory manufacturing plants in the country. Incidentally you will see during the visit another well equipped electro-plating department and one also that is largely automatic. The department is headed by Ralph McCracken and turns out nickel, zinc and copper work. If it pertains to the trap-drummer's work, the Leedy company makes it. The company was organized in 1898 but did not install its own electric-plating department

until 1905. It is equipped with automatic tumblers and platers and both polishing and buffing is done on a large scale at the plant.

INDIANAPOLIS BRANCH MEETING

The Indianapolis Branch held its regular meeting May 14 with President Hennessey presiding over a good attendance. One member was elected. It was decided to re-elect the old officers unanimously. They stand as follows: President, R. Hennessey; vice-president, F. McDonald; secretary-treasurer, Louis Mertz; librarian, B. D. Aufderheid; Board of Managers, George Bechtel, F. McDonald and R. McCracken. Convention delegates elected were William Lamoureaux, B. D. Aufderheid and George Barrows. Alternates, C. Cromer, H. Maze and F. McDonald. Reports of convention committees were listened to with interest, especially the program as outlined, and the members were well pleased with the efforts put forth by the ladies for the entertainment of the lady visitors.

GENERAL PROGRAM

June 29

MORNING

Arrival and reception of delegates and visitors in Claypool Hotel lobby.

AFTERNOON

1:00 P. M. Registration of all members of the society and guests. Inspection of delegates' credentials. Distribution of badges and tickets for all events.

3:00 P. M. All assemble in Hotel Parlors on second floor to get acquainted and to renew past friendships.

EVENING

7:30 P. M. Educational session, Assembly Room, 8th floor. **Special Extra:** Prof. Hiram S. Lukens, University of Pennsylvania.

June 30

MORNING

8:30 A. M. Meeting of Executive Board and Credential Committee on 8th floor.

9:30 A. M. Convention called to order by President Richard Hennessey, Indianapolis Branch.

10:05 A. M. Address of Welcome by Hon. Charles Jewett, Mayor of Indianapolis.

10:20 A. M. Acceptance of the Key of the city by National President Sylvester Gartland.

10:30 A. M. Opening address by President Hennessey, Indianapolis Branch.

10:45 A. M. Introduction of members.

11:00 A. M. Address, Charles H. Proctor, New York.

11:30 A. M. Address, Oscar E. Servis, Past President, Chicago.

12:00 A. M. Address, H. H. Williams, Editor of Monthly Review, St. Louis.

12:30 A. M. Adjourn.

AFTERNOON

2 P. M. Business Session, Hotel Claypool, papers will be read and discussed.

These sessions will be of a high educational value and all should consider it a great privilege to attend every one.

EVENING

8 P. M. Business Session, Hotel Claypool, Reading and Discussing of Papers.

THE PRIDE OF INDIANAPOLIS—THE SOLDIERS' AND SAILORS' MONUMENT ERECTED IN MEMORY OF THE MEN KILLED IN BATTLE DURING THE CIVIL WAR. IT IS SAID TO BE THE LARGEST MONUMENT OF ITS KIND IN THE WORLD AND STANDS 212 FEET ABOVE THE STREET LEVEL.

July 1

MORNING

8 A. M. Take automobiles on Kentucky avenue between Illinois street and Capitol avenue for picnic at Columbia Park.

9:30 A. M. Business Session in pavilion.

AFTERNOON

12:30 P. M. Luncheon—Have your appetite well polished. After you have satisfied "the inner man" all will indulge in the different games. African Golf and Galloping Dominoes barred.

4:30 P. M. Return to Hotel.

EVENING

7:30 P. M. Business Session, Assembly Room, Claypool Hotel, Reading of Papers and Discussion. **Extra:** Prof. F. G. Mathers, Indiana University.

July 2

MORNING

8 A. M. Business Session, Assembly Room, Claypool Hotel, Revision of Constitution. Election of Officers. Selection of 1922 Convention City. Final Business Session.

AFTERNOON

2 P. M. Automobile Sight Seeing Trip around City of Indianapolis, parks and boulevards. Meet west side of State Capitol building (Senate avenue north of Washington street). If you are on time, the committee will be very grateful to you. We want to start promptly.

EVENING

6:30 P. M. Dinner, Dance, Riley Room, Claypool Hotel. Installation of officers. Good entertainment speeches that will interest you. Dancing up to 12.00 o'clock. Do not fail to attend as Indianapolis Branch wants to show you that they were on the job until the last minute.

LADIES' PROGRAM

June 29

MORNING

Arrival and reception of delegat nd visiotors in Claypool Hotel lobby.

AFTERNOON

1 P. M. Registration of all members of the society and guests. Distribution of badges and tickets for all events.

3 P. M. All assemble in Hotel Parlors on second floor to get acquainted and to renew past friendships.

3.30 P. M. Shopping through L. S. Ayres Department Store.

EVENING

7:00 P. M. Theatre Party—Circle Theatre.

June 30

MORNING

9 A. M. Trip through Market House.

11:30 A. M. Luncheon at Spink Arms.

AFTERNOON

2 P. M. Visit to Library and Art Institute.

EVENING

7:30 P. M. Meet with the men at Regular Business Session in Assembly Room, 8th floor.

National Officers of the American Electro-Platers' Society, 1920-1921

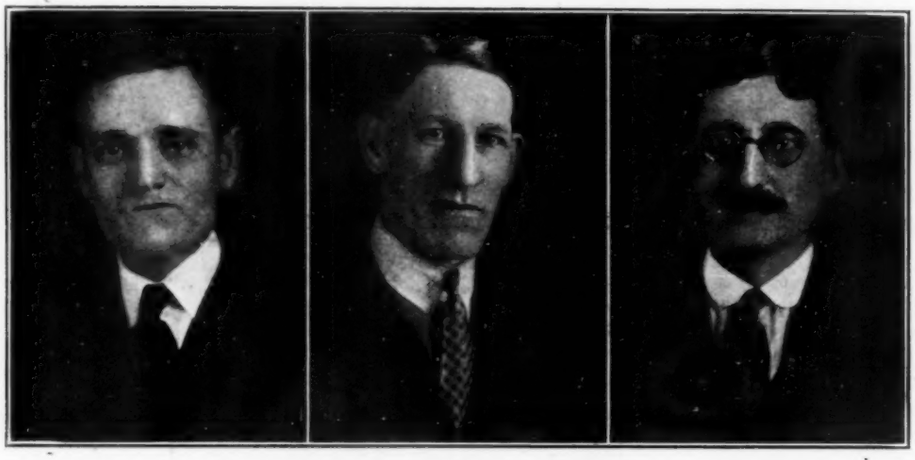
S. P. GARTLAND,
National President.

PHILIP UHL,
National 1st Vice-President.

W. J. ALLEN,
National 2nd Vice-President.

JOHN E. STERLING,
National Secretary.

Officers of the Indianapolis, Ind., Branch

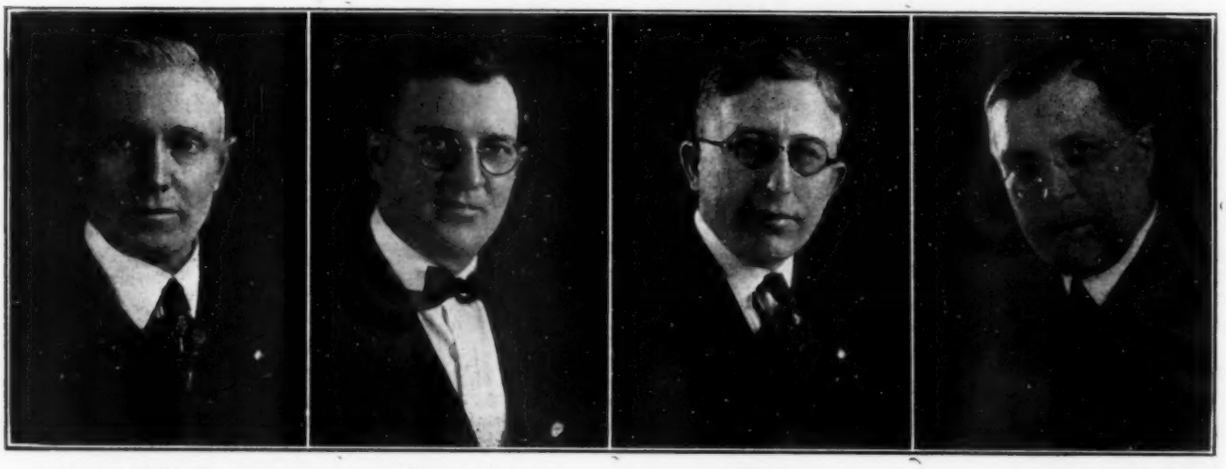


RICHARD HENNESSY,
President, Indianapolis Branch.

FRANK McDONALD,
Vice-President, Indianapolis Branch.

LOUIS MERTZ,
Secretary-Treasurer, Indianapolis Branch, and Chairman Entertainment and Registration Committee.

Members of Indianapolis Executive Committee



GEORGE BARROWS,
Chairman Program, Publicity and Exhibits Committee.

JAMES WALSH,
Chairman Transportation Committee.

HAL WARNER,
Chairman Reception Committee.

B. D. AUFDERHEIDE,
Chairman Educational and Banquet Committee.

July 1

MORNING

8 A. M. Take automobiles on Kentucky avenue between Illinois street and Capitol avenue for picnic at Columbia Park.

AFTERNOON

12:30 P. M. Luncheon—After you have partaken, you will witness the male members in their annual sports.

4:30 P. M. Return to hotel.

EVENING

7.15 P. M. Meet on Parlor Floor to go to Murat Theatre.

July 2

MORNING

9 A. M. Trip up Soliders' and Sailors' Monument.

AFTERNOON

2 P. M. Automobile Sight Seeing Trip around City of Indianapolis, parks and boulevards.

Meet west side of State Capitol building (Senate Ave. north of Washington Street). If you are on time the committee will be very grateful to you. We want to start promptly.

EVENING

6.30 P. M. Dinner, Dance, Riley Room, Claypool Hotel. Installation of officers. Good entertainment speeches that will interest you. Dancing up to 12.00 o'clock.

Do not fail to attend as Indianapolis Branch wants to show you that they were on the job until the last minute.

Railroad Rate Arrangements

A rate of one and one-half fare on the "Certificate Plan" will apply for members attending the meeting of the American Electro-Platers' Society, to be held at the Claypool Hotel, Indianapolis, Ind., and also for visitors and dependent members of their families. The arrangement will apply from the Central Passenger Association territory.

The following directions are submitted for your guidance:

1. Tickets at the one way tariff fare for the going journey may be obtained on any of the following dates (but not on any other date), June 25-July 1.

Be sure that when purchasing your ticket you ask for a CERTIFICATE. **Do not make the mistake of asking for a receipt.**

2. Present yourself at the railroad station for ticket and certificate at least thirty minutes before departure of train on which you will begin your journey.

3. **Certificates are not kept at all stations.** If you inquire at your home station you can ascertain whether certificates and through tickets can be obtained to place of meeting. If not obtainable at your home station, the agent will inform you at what station they can be obtained. You can in such case purchase a local ticket to the station which has certificates in stock, where you can purchase a through ticket and at the same time ask and obtain a **certificate** to the place of the meeting.

4. Immediately on your arrival at the meeting present your certificate to the endorsing officer, Mr. John E. Sterling as the reduced fare for the return journey will not apply unless you are properly identified as provided for by the certificate.

5. It has been arranged that the special agent of the carriers will be in attendance on July 1 from 8:30 A. M. to 5:30 P. M. to validate the certificates. If you arrive at the meeting and leave for home prior to the special agents arrival, or if you arrive at the meeting later than July 1, after the special agent has left, you cannot have your certificate validated and consequently you will not obtain the benefit of the reduction on the home journey. It is inferred that you will wish to attend all the sessions of the convention, and that you will, if possible, be present commencing the opening date of the convention. However, so far as the validation of the certificate is concerned, you should so time your going trip as to enable you to present the certificate for validation prior to departure of the special agent of the railroads on the last validation date above named, for, while provision is made for validation of certificates if the required minimum of 350 are presented, as explained in the next paragraph, a reduced fare ticket on the return trip is obtainable only on the dates above named, and during the office hours indicated. **No refund of fare will be made on account of failure to either obtain a proper certificate nor on account of failure to have the certificate validated.**

6. So as to prevent disappointment, it must be understood that the reduction on the return journey is not guaranteed, but is contingent on an attendance of not less than 350 members of the organization and dependent members of their families, at the meeting, holding regularly issued certificates obtained from ticket agents at starting points, showing payment of regular one-way tariff fare of not less than 67 cents on going journey.

7. If the necessary minimum of 350 certificates are presented to the special agent, and your certificate is validated, you will be entitled up to and including July 6th, to a return ticket via the same route over which you made the journey, at one-half the regular one-way tariff fare from the place of the meeting to the place at which your certificate was issued.

8. Return ticket issued at the reduced fare will not be good on any limited train on which such reduced fare transportation is not honored.

A Plating Problem

By C. H. PROCTOR, Founder, A. E. S. Plating Chemical Editor The Metal Industry

Q.—Can you help me in this little trouble I have with my nickel solution? Since Winter I have found out that my nickel solution is getting very cold, and it does not work as I would like it to work. My solution stood at 10 deg. during Summer and came down to 7 deg. My anodes get full of nickel salt. I thought I would add a little ammonia but they still work very stiff.

A.—Electroplating solutions do not give as satisfactory results when their temperature runs below 70 degrees Fahr., as when maintained at this temperature or between 70 and 80 degrees. This temperature refers to solutions that we may term cold solutions, nickel and silver, brass, bronze, etc., although solutions may be run more efficiently if the temperature is still increased (with the exception of silver).

We might liken an extremely cold solution to an automobile motor on a Winter's day; it frequently takes time to get them started when cold. The gases are dormant and lack energy until the motor becomes warm enough. The action of a cold plating solution is similar.

It is a fallacy to reduce the solution when it becomes cold, if it has given good results through the Summer and Fall months, even though the solution crystallizes out in the form of nickel salts upon the anodes due to the lower temperature.

If you have steam in your plating department, it is easy to make a connection somewhere with an extra piece of steam pipe and a valve to control the steam. In the mean time secure a piece of lead pipe with a half-inch, five-eighths or three-quarters inch hole. The lead pipe should be long enough, so that it will extend through the entire length of the plating tank at the bottom and up over both ends of the tank. Connect the lead pipe with your inlet steam pipe by a piece of rubber hose. On the end that comes down outside of the tank attach a valve to control the steam coming through the lead pipe. Have a wooden pail or some receptacle to take care of the water that results from the condensation of the steam in the lead pipe.

When all is ready turn on your steam and control it with the outlet valve. In fifteen minutes you can raise the temperature of a nickel solution from 40 to 70 degrees or more. Your solution will be kept active and there will be no necessity for reducing the strength of the solution to overcome crystallization. Do not add ammonia to your solution to overcome your difficulty, or you will run into more serious trouble.

Metal Plating

Part 10—Gold Plating. This Paper Presents a Tabulation Showing the Time Required to Deposit a Given Thickness of Gold with Different Values of Current Densities. Some Remarks Relating to the Properties of Gold, the Preparation of Gold Plating Solutions, Their Maintenance, etc., Are Also Given.

Written for The Metal Industry by W. G. KNOX

PROPERTIES

Gold is a soft yellow metal, very ductile and malleable. It can be highly polished and because of its resistance to atmospheric influences the polished surface will be retained for considerable periods. Accordingly, due to this resistance to corrosion which gold offers to the more common acids and gases, it has come into rather extensive use in the electroplating field either as a pure metal or alloyed with other metals such as copper and silver.

PROTECTIVE QUALITIES

Gold is an electro negative metal and for this reason is seldom used alone as a protective coating for such of the base metals as iron or steel. Usually it is plated on the latter after an electro-plated coating of copper or brass has been applied and polished, scratch brushed, acid etched or sanded as the occasion demands.

Because of the softness of gold it can be burnished or "laid down" on a prepared surface so that it is practically impervious, but this frequently requires considerable hand work, particularly for objects which are irregularly shaped and for commercial production the heavy expense of this work in many cases is not warranted.

METHODS OF APPLICATION

There are three general ways of depositing gold. These are described briefly below:

(1) Mercury gilding
(2) Simple immersion
(3) Electro-plating

1. Mercury Gilding. This method of gilding is one of the oldest methods known for applying gold to objects. It is said to be used occasionally even now but the uses are so limited as to make it comparatively unimportant in view of more efficient modern methods.

Briefly, the process is based on the preparation of an amalgam with mercury applied with a brush which has been previously treated by dipping into nitrate of mercury or an equivalent salt. The coated parts are later heated to approximately 400° C. at which temperature the mercury is driven off. If the surface of the objects are then further rubbed or brushed the deposit of gold is brought out in better relief.

2. Simple immersion. The position of gold in the electromotive series of metals is such as to cause it to readily plate out of a solution of its salts by immersion of most other metals in the gold solution. The practice is usually carried out in hot solutions which are made up frequently with sodium phosphate or pyrophosphate and gold chloride as a basis with other materials to improve the working properties of the bath.

Contrary to the opinions of some operators it is not necessary to use the "quicking" method to secure a good deposit.

On the other hand, it is recommended that the objects, if made of pewter, iron or other base metals, be copper-plated before dipping or suspending in the gold solution. More uniformity of color and shade is obtained in this way. It must be understood that the gold deposited by the immersion process is necessarily very thin as its deposition can take place only as long as the immersed metal is exposed. As soon as the gold has competely covered the surface of the object the reaction ceases. Because of the very limited thickness of gold coatings obtained in this way their usefulness is also limited.

Electro-plating. The electro-plating of gold has assumed considerable promise in recent times because of the simplicity and ease with which the solutions may be prepared and operated. Much of the mystery surrounding the gold-plating industry has been cleared up during the last few years and it is now possible to obtain from the present-day text books all necessary information in connection with the making up and operation of gold-plating baths for general and for specific classes of work.

In preparing solutions of gold for plating purposes it is well to recognize the fact that the simpler the formula the easier it is to diagnose subsequent troubles. For instance, in straight gold-plating work on parts which require a fairly heavy deposit, it should be perfectly feasible to employ gold chloride and potassium cyanide with water made up to a strength commensurate with the specific requirements at hand. The gold chloride is first converted to the so-called "fulminating gold" by precipitation with ammonium hydroxide in the usual manner and the precipitate is dissolved with potassium cyanide using a slight or large excess as may be required. It is necessary to boil off the ammonia before using the solution replacing that lost in evaporation with distilled water.

For highly buffed work less free cyanide will be preferable. For heavier deposits and for general plating larger amounts of free cyanide will be found advantageous. Anode corrosion is also better with the larger amounts of free cyanide. The maintenance of the above type of bath is quite simple. There are, for all practical purposes, only two main things the operator has to consider. These are: (1) the amount of gold in his solution and (2) the free cyanide content. If the solution deposits dark under constant temperature-current control more gold in the proper form will probably bring it back to normal. On the other hand, if the anodes darken slightly, the free cyanide should be increased. In special work which the writer has carried on for the past year or two, the above type of solution has given entire satisfaction with the addition only of gold compounds or cyanide of potassium. A concentrated stock solution of gold chloride is kept on hand and additions made to the plating bath to compensate for the steady drain of gold which is plated out and which is not maintained by the anode. The gold chloride is converted to fulminate before its addition to the bath.

There are other ways of preparing the above bath but in each case the final result is practically the same. For instance, the solution may be prepared by dissolving gold directly in potassium cyanide with the aid of an electric current. In this case the anode is suspended in the solution in which a porous cup containing a carbon or other cathode is placed. The current dissolves the gold from the anode forming the potassium-gold cyanide. Again the gold may be made into the chloride by dissolving it with aqua regia (nitric-hydrochloric, 1:3), and driving off the nitric acid with an excess of hydropchloric acid and evaporating to remove the excess of the latter acid. The salt prepared in this way is usually contaminated with acid and is known as, or called, the acid salt. (HCl-$AuCl_3$. $4\,H_2O$.) From this piont the salt is converted to the "fulminating gold" originally described.

CONTROL OF THE DEPOSIT

It is well known that the concentration of gold in the bath, the free cyanide, the temperature and the current play a very important part in the appearance and character of the deposit. A pale yellow or a rich rose gold may be obtained from the solution by simply varying one or more of these factors. These things are so well known as to call for no comment here.

There are a few platers who control the character of the deposit to a certain extent by manipulating the anode. That is, by raising or lowering it in the solution. In commercial plating work this is highly undesirable. The more agreeable method is to use an external resistance rheostat of suitable capacity in series with a current recording meter. Warm solutions promote anode solution and lower the resistance appreciably. Current densities

TIME REQUIRED FOR A THICKNESS IN INCHES OF GOLD (MONOVALENT).
Calculated on a basis of 100% cathode efficiency.
Hours, Minutes, and Seconds.

Current Density: Amps Per Sq. Foot	Amps Per Sq Inch	.00001	.00002	.00003	.00004	.00005	.00006	.00007	.00008	.00009	.0001	.0002	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.001	.002
.50	.0035	:07 25	:15	:22	:30	:37	:45	:52	:59	1:07	1:14	2:28	3:42	4:56	6:10	7:24	8:38	9:52	11:06	12:20	24:40
1.00	.0070	:03 42	:07 24	:11	:15	:19	:23	:26	:30	:34	:37	1:14	1:51	2:28	3:05	3:42	4:19	4:56	5:33	6:10	12:20
1.50	.0105	:02 45	:05 32	:07 24	:08 18	:14	:17	:20	:22	:25	:28	:56	1:23	1:51	2:19	2:47	3:15	3:43	4:10	4:37	9:14
2.00	.0140	:01 51	:03 46	:04 50	:07 09	:09 13	:11	:13	:15	:17	:19	:37	:55	1:13	1:32	1:51	2:09	2:27	2:46	3.04	6:08
2.50	.0175	:01 29	:02 18	:04 21	:05 26	:07 14	:08 23	:10 23	:11	:13	:15	:30	:45	1:00	1:14	1:29	1:44	1:59	2:14	2:29	4:58
3.00	.0210	:01 14	:02 28	:03 42	:04 52	:06 10	:07 45	:08 30	:09 32	:11	:13	:25	:37	:49	1:04	1:17	1:30	1:42	1:55	2:04	4:08
3.50	.0245	:01 05	:02 07	:03 10	:04 13	:05 17	:06 20	:07 24	:08 27	:09 30	:10 34	:21	:32	:42	:53	1:04	1:15	1:26	1:37	1:47	3:34
4.00	.0280	:00 56	:01 51	:02 46	:03 45	:04 38	:05 33	:06 29	:07 24	:08 20	:09 15	:19	:28	:37	:46	:55	1:04	1:13	1:22	1:33	3:06
4.50	.0315	:00 50	:01 39	:02 28	:03 18	:04 08	:04 57	:05 47	:06 36	:07 26	:08 15	:17	:25	:33	:41	:49	:57	1:05	1:14	1:23	2:46
5.00	.0350	:00 45	:01 28	:02 12	:02 56	:03 40	:04 24	:05 08	:05 52	:06 36	:07 20	:15	:22	:30	:37	:45	:53	1:00	1:08	1:14	2:28
5.50	.0385	:00 41	:01 20	:02 01	:02 42	:03 23	:04 03	:04 44	:05 25	:06 02	:06 45	:14	:20	:27	:34	:41	:48	:55	1:01	1:08	2:16
6.00	.0420	:00 37	:01 15	:01 51	:02 28	:03 05	:03 42	:04 19	:04 56	:05 33	:06 10	:13	:19	:25	:31	:37	:43	:50	:56	1:02	2:04
6.50	.0455	:00 34	:01 08	:01 42	:02 16	:02 50	:03 24	:03 58	:04 32	:05 06	:05 40	:11	:17	:23	:29	:35	:41	:47	:53	:57	1:54
7.00	.0490	:00 32	:01 04	:01 36	:02 08	:02 40	:03 12	:03 44	:04 16	:04 48	:05 20	:10 40	:16	:21	:27	:33	:39	:44	:50	:54	1:48
7.50	.0525	:00 30	:01	:01 30	:02	:02 30	:03	:03 30	:04	:04 30	:05	:10	:15	:20	:25	:30	:35	:40	:45	:50	1:40
8.00	.0560	:00 28	:00 56	:01 24	:01 52	:02 20	:02 48	:03 16	:03 44	:04 12	:04 40	:09 20	:14	:19	:24	:29	:34	:39	:44	:47	1:34
8.50	.0595	:00 26	:00 53	:01 18	:01 44	:02 10	:02 36	:03 03	:03 28	:03 55	:04 21	:08 42	:13	:18	:22	:27	:32	:36	:40	:44	1:28
9.00	.0630	:00 25	:00 49	:01 14	:01 38	:02 03	:02 28	:02 52	:03 17	:03 42	:04 06	:08 12	:12	:17	:21	:25	:29	:33	:37	:41	1:22
Grams Per Square Inch		.00316	.0063	.0095	.0127	.0158	.0190	.0222	.0253	.0285	.03170	.0634	.0950	.1270	.1582	.1900	.222	.253	.285	.317	.634

Atomic Weight of Gold ---------- 197.
Specific Gravity of Gold ---------- 19.3
Electro-Chemical Equivalent of Gold ------ .00204

Note — Time below 11 minutes given in minutes and seconds; 11 minutes and above given in hours and minutes.

W.G.K.

TABLE SHOWING RATE OF DEPOSITION OF MONOVALENT GOLD.

TIME REQUIRED FOR A THICKNESS IN INCHES OF GOLD (TRIVALENT)
CALCULATED ON THE BASIS OF 100% CATHODE EFFICIENCY
HOURS MINUTES AND SECONDS

CURRENT DENSITY																					
AMPERES PER SQ. FOOT	AMPERES PER SQ. INCH	.0001	.0002	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.001	.002	.003	.004	.005	.006	.007	.008	.009	.01	.02
50	.0035	:22	45	1.07	1.29	1:51	2:14	2:36	2:58	3:20	3:42	7:24	11:06	15:48	18:27	22:08	25:50	29:31	33:12	36:54	73:48
100	.0070	.11	:22	:33	:44	:55	1:07	1:18	1:29	1:40	1:51	3:42	4:52	7:23	9:14	11:04	12:55	14:46	16:36	18:27	36:54
150	.0105	:07 23	:15	22	:30	:37	:44	:52	:59	1:07	1:18	2:36	3:51	5:12	6:29	7:47	9:05	10:23	11:41	12:59	25:58
200	.0140	:05 30	11	.17	:21	:28	:33	:39	:43	:50	:56	1:51	2:46	3:42	4:37	5:32	6:28	7:23	8:08	9:14	18:28
250	.0175	:04 36	:08 46	:14	.18	:22	:27	:31	:36	:40	:45	1:29	2:13	2:58	3:44	4:26	5:11	5:56	6:39	7:24	14:48
300	.0210	:03 43	:07 54	.11	.15	.19	.23	:26	:30	:34	:37	1:14	1:51	2:28	3:05	3:42	4:19	4:56	5:33	6:10	12:20
350	.0245	:03 10	:06 20	:09 30	.13	:16	:19	:22	:25	:29	:32	1:04	1:35	2:07	2:39	3:10	3:42	4:14	4:46	5:17	10:34
400	.0280	:02 46	:05 32	:08 18	.11	:14	:17	:20	.22	:25	:28	:56	1:23	1:51	2:19	2:47	3:14	3:32	4:09	4:37	9:14
450	.0315	:02 28	:04 56	:07 24	:09 52	:13	:15	:18	:20	:22	:25	:50	1:14	1:39	2:04	2:29	2:53	3:18	3:43	4:07	8:14
500	.0350	:02 13	:04 26	:06 39	:08 52	:11	:14	:16	:18	:20	:23	:45	1:07	1:29	1:51	2:13	2:35	2:58	3:20	3:43	7:26
550	.0385	:02 01	:04 03	:06 03	:08 04	:10 05	:12	:14	:16	:18	:21	:41	1:01	1:21	1:41	2:01	2:21	2:42	3:02	3:23	6:46
600	.0420	:01 51	:03 42	:05 33	:07 24	:09 15	:11	:13	:15	:17	:19	:37	:56	1:14	1:33	1:52	2:10	2:29	2:47	3:05	6:10
650	.0455	:01 42	:03 24	:05 06	:06 48	:08 30	:10 12	:12	:14	:16	.17	:34	:51	1:08	1:25	1:42	1:59	2:16	2:33	2:50	5:40
700	.0490	:01 35	:03 10	:04 45	:06 20	:07 55	:09 30	:11	:13	:15	:16	:32	:48	1:04	1:19	1:35	1:51	2:07	2:23	2:39	5:18
750	.0525	:01 29	:02 58	:04 27	:05 56	:07 24	:08 56	:10 33	:12	:14	:15	:30	:45	:59	1:14	1:29	1:44	1:58	2:13	2:28	4:56
800	.0560	:01 23	:02 46	:04 09	:05 32	:06 53	:08 18	:09 41	:11	:13	:14	:28	:42	:56	1:10	1:23	1:37	1:51	2:05	2:18	4:36
850	.0595	:01 18	:02 36	:03 46	:05 12	:06 30	:07 48	:09 06	:10 24	:12	:13	:26	:39	:52	1:05	1:18	1:31	1:44	1:57	2:10	4:20
900	.0630	:01 13	:02 24	:03 36	:04 48	:06	:07 13	:08 24	:09 36	:10 48	:12	:24	:36	.48	1:00	1:12	1:24	1:36	1:48	2:00	4:00
GRAMS PER SQUARE INCH		.0031G	.0063	.0095	.0127	.0158	.0190	.0222	.0253	.0285	.0317	.0634	.0950	.1270	.1582	.1900	.2220	.2530	.2850	.3170	.6340

ATOMIC WEIGHT OF GOLD ---------- 197.0
SPECIFIC GRAVITY OF GOLD ---------- 19.3
ELECTRO-CHEMICAL EQUIVALENT OF GOLD (TRIVALENT) ---- .000681

NOTE - TIME BELOW 11 MINUTES GIVEN IN MINUTES AND SECONDS, ABOVE 11 MINUTES GIVEN IN HOURS AND MINUTES.

WGK

TABLE SHOWING RATE OF DEPOSITION OF TRIVALENT GOLD.

vary depending upon conditions but usually they average between .5 and 2 amperes per square foot of plating surface.

ALLOY BATHS

The above refers to deposition of pure gold, so-called 24-Karat. The deposits are always soft and consequently will not stand appreciable wear. In order to increase the hardness of electro-deposited gold it is frequently recommended that small amounts of copper or silver be added to the bath. These metals in addition to increasing the hardness of gold also reduce the expense of the operations in that a certain amount of gold is replaced by the cheaper element. Many and varied effects are produced with these alloy baths and they are very generally used by the trade at the present time. Copper-gold produces what is known as "Red gilding" and silver-gold, "green gild-

ing." The control of these alloy solutions is somewhat more difficult than with straight or unalloyed gold but it is done and by many quite effectively so as indicated by the uniformity of color produced in consecutive operations on a large number of parts. The methods of preparing the various gold alloy solutions may be found in any of the more modern works on electroplating.

RATE OF DEPOSITION

The rate of deposition of gold (pure) depends on the series to which it belongs. There are two of these, i. e., the "Aurous" and "Auric" salts. The one with which we are principally concerned is the former—Au. CN. KCN or the monovalent type. The deposition rate is high, being 7.357 grams per ampere hour. The "Auric" or tri-valent gold is deposited at exactly one third the rate or 2.452 grams per ampere hour. The latter type of solution can be prepared but it is not often used. Table No. 10 shown herewith is for the monovalent bath. It has been compiled to cover thicknesses of gold from .00001 in. to .002 in. in somewhat smaller divisions of current density than with copper, nickel, etc., since the maximum current permissible is usually under 10 amperes per square foot of plating surface. However, the table is considered broad enough to cover the average requirements of the trade. For refining, simple calculations only are required to obtain the time elements for any desired thickness of metal.

For convenience and for the reason that the tri-valent type of gold is not often employed the table (No. 11) for this type of gold solution is also included in this issue. It will be well to remember, however, that table No. 10 is the one which normally should be used in making calculations for deposition of gold.

A Few More Facts From the Plater

Work and Working Conditions in the Plating Shop

Written for The Metal Industry by HERBERT LOWNDES

It is surprising how hard it is for some of the platers to try out new methods. There are many large and small plating rooms today, that have not adopted the Sangamo meter, and I have known many platers who, when told they were going to have Sangamo meters put on all their tubs, would "go up in the air," but after running them for a while, would come down and say, "I don't know how I ever got along without one," and also that they would not work in a plating room again unless such meters were installed on the tubs.

It takes but a short time for a Sangamo meter to pay for itself in silver saved, to say nothing of the time saved in watching work while it is running. All the plater has to do when a lot of work is in the meter, is to set it to the required amount, allowing for loss on wire or racks. Then he can leave it and get other work ready, because when the deposit is made, a bell will ring until the plater shuts off the power, and takes out the work. In the old way of plating without the Sangamo meter, the plater has to load up the different tubs or empties, so that his amperes rise or fall, and he has to keep a close watch, and raise or lower his power accordingly. Now fluctuation of power makes no difference to tubs equipped with Sangamo meters, as the lots of work in the tubs are bound to get the required amount of plate.

I would like to say that I think the opportunities for the plater are just as good today, or even better, than they were years ago, although there are Foreman Platers today who would hide and shroud in mystery their supposed knowledge and secrets. But the man of today, if he is out to get the very best results, can get them and does, for he can obtain the desired information from the many books on plating to be found in the public libraries. What prevents many men from making a success in the plating room is their carelessness, or not realizing the importance of keeping their hands clean. I mean that when working in the plating room, it is almost impossible to prevent cyanide or potash getting on the hands. That would not be serious if it were immediately washed off, but it is a common habit for new employees to let it dry on the hands, and the result is cyanide or potash sores. He may try every salve known for healing the sores without results, because he continues to get more cyanide or potash on his hands while about his daily work. Finally, he will consult a doctor, who will inform him the trouble is due to acid fumes getting into his blood and that the plating room is injurious to his health, and advise him to give up his work.

I have seen this happen so many times, that I think the doctor is honest in what he thinks about the plating room. But he is certainly mistaken. If the doctors would take a walk thru some of the plating rooms, they would see some remarkable looking men, and if they knew the ages of these employees, they would get the surprise of their lives. Most of the employees have worked from boyhood to manhood in the plating room. The only sickness I have ever seen in a plating room is from cyanide sores, due to cuts and scratches. I have yet to see a man get sick from working in the plating room.

A sure cure for cyanide or potash sores is to wash the hands thoroughly in warm water, as hot as one can bear it, dry thoroughly, then rub vinegar on the hands, which will make them smart for 10 or 15 minutes, rub dry, and you will get relief. Providing you don't get any more cyanide or potash on, it will cure right away. I might say it is a hard proposition to be breaking in green help, and just get them where they are becoming useful, when they leave on account of cyanide sores. A good many plating rooms are breaking in girls, and those that stick it out are becoming very useful and taking hold. In fact, some of the best butler finishers I have ever had are women.

I think most platers will agree with me, that nearly all the troubles in a plating room are due to green help. They do not realize the importance of doing just as they are told, and go on taking chances, run their hands thru their hair, eat sandwiches, or any old thing, but never think it necessary to wash their hands. In 1917, 1918 and 1919 business was so good that it was one continual rush for production, and sometimes I think quality has been sacrificed for quantity. At the present time, most factories have a higher standard for packing room inspection than for metal inspection. The number of inspectors employed in the various departments is proof of this, and it surely is poor policy, inasmuch as any defects which exist in the article before it is plated will also exist after plating.

Electric vs. Crucible Furnaces

Letters from H. W. GILLETT, Chief Alloy Chemist, U. S. Bureau of Mines* and T. H. A. EASTICK on Opposite Sides of This Question

Both these letters are criticisms of earlier publications in The Metal Industry. We are glad to publish the opinions of men so thoroughly conversant with their respective arts.—Ed.

DR. GILLETT'S OPINION

To the Editor of THE METAL INDUSTRY:

The letter of your anonymous correspondent, "Equipment Engineer" on p. 166 of your April issue, in which he passes adverse judgment on electric brass furnaces, hardly seemed to call for comment, first, because it was anonymous; second, because its writer seems to have but hearsay knowledge of electric furnaces, judging by his carefully describing load factor and terming it "power factor," and third, because his argument is based on conditions in so small a rolling mill as not to be able to utilize regularly the output of a one-ton electric furnace. Irrespective of its melting costs, such a mill would have a hard row to hoe in competition with the big fellows.

His second letter, p. 208 of your May issue, includes some remarks on the subject of conservation that seem too misleading to allow to pass.

Taking the two letters together, they contain many points with which the writer quite agrees.

1. Small electric furnaces are less efficient than large ones of the same type.
2. Continuous operation raises the efficiency of an electric furnace, i.e.—24 hour operation is on a more efficient basis than 8 hour.
3. Items of interest and depreciation on furnace equipment should be included in melting costs, and on small or intermittently operated electric furnaces, these items, per ton, are far from negligible.
4. Prices for electric power are higher when but little is used—as with a single small furnace used 8 hours per day—than when enough is used to earn a lower wholesale rate—as with a battery of large furnaces, especially when used 16 or 24 hours per day.

These points lead to the conclusion that while electric melting is cheaper for the big mills (as shown by the adoption of various types of electric furnaces by the leading brass rolling mills whose engineers and managers may be assumed to be level-headed) it may not be for a one-furnace mill. One-furnace rolling mills are a negligible factor in the brass industry, but in the sand-casting game the one-furnace foundry fills a real local need, and "Equipment Engineer's" comments are valuable when applied to such foundries.

Small foundries which cannot utilize a one-ton or at least a half-ton electric furnace fairly steadily, which can only operate one 8 hour shift and which cannot earn a lower rate than 3c. per K.W.H. may or may not be able to save money by electric melting. A host of factors have to be taken into account, and it is quite likely that the coke-fired crucible furnace will be the cheapest melting medium in many such cases.

Such cases are not likely to offer "Equipment Engineer" a field for the installation of a by-product gas plant, and where wholesale rates for electric power are 3c. per K.W.H, city gas rates are also likely to be up.

Nevertheless there are a lot of small foundries working under the handicap of high power costs, using small electric furnaces or larger ones of comparatively low efficiency, which find electric melting desirable. The better working conditions for the melter do not show in the cost sheets, but they are of value nevertheless.

It is folly for a plant to put in an over-capacity in expensive electric furnaces. It is equal folly to fail to install an electric furnace if it will, under the particular plant conditions, melt the plant's regular output more cheaply than its old equipment. The old equipment can be held in reserve to handle "peak loads," while the idle part of a too-large electric furnace equipment would eat its head off in interest charges.

The tiny foundries in localities where 150 K.W. would overload the central station, or where, if they can get the power, they have to pay 3 to 5c. per K.W.H. for it, are many in number, but their output does not bulk very large in the statistics of the brass industry.

At a venture the writer will guess, that 90% of the country's output of brass and bronze is melted in industrial centers and in plants which could earn a 2c. rate or lower for their electric furnace power.

If one can't see the 90% woods for the 10% trees, one may think that the trend toward electric melting by the larger and more progressive firms is regrettable, but the repeat orders on the lists of the prominent electric furnace makers indicate that if the managers of these plants have been fooled at all, many of them have been fooled more than once. One who has watched the progress of electric brass melting grow from early infancy to at least a pretty lusty youth may be pardoned a quiet chuckle at the evidence in "Equipment Engineer's" letter that the burden of proof of fitness seems now to rest on fuel-fired furnaces. Advertising propaganda might sell a few electric furnaces. Only commercial usefulness would bring about the installation of the nearly 400 electric brass furnaces now in use or on order.

In his April letter your correspondent gives us the old saw about liars and figures, so he should not object to having the figures in his May letter criticized. He credits crucibles with a 1.3% zinc loss. One can do that on a test, with careful operation. A whole lot of mill superintendents would be tickled pink if they could do it in regular work. Apparently "Equipment Engineer's" crucibles never leak or break in the fire and no metal gets spilled over into the ashes, as he doesn't give any metal recovery costs. His ashes also remove themselves.

These are desirable conditions, but seldom attained.

I have already commented on the 3c. power figure. Power at 2¾c. will give equal melting costs with coal and electricity on "Equipment Engineer's" figures. At any less price electric melting is the cheaper on his own showing. A depreciation charge of 20% is a trifle high. There are a lot of electric furnaces in use after two or three years that are worth 75% of their original cost.

But, suppose we go at the matter from another angle. Suppose we take a big rolling mill under heavy production, which can use a one-ton furnace steadily 24 hours a day for a year. Take "Equipment Engineer's" figures for single shift work as a basis. Steady use would cut the power consumption from 300 K.W.H. per ton to about 225, and the power cost from 3c. to about 2½c. under conditions where it would cost 3c. on single shift operation. The daily output would be at least tripled.

*Published with the approval of the Chief of the Division of Mineral Technology and the Chief of the Publication Division of the Bureau of Mines.

We have, then,

Power cost per ton	$5.62½
Labor	3.00
Zinc loss	1.20
Supplies and repairs	2.00
	$11.82½
15 tons per day, 250 days, say 3,750 tons	44,343.75
First cost of furnace and equipment	15,000.00
Interest at 7% on 15,000 1 year	1,050.00
	$60,393.75
Pit fires—3 shifts:	
Coal cost per ton of brass	4.40
Labor	5.555
Zinc loss, 26 lbs. at 6c	1.56
Crucibles	4.667
Repairs	.50
	16.68 per ton
13½ tons per day, 278 days, 3,750 tons	62,550.00
Interest and depreciation on $5,000 at 32%	1,218.80
$4.40 per working day	
	$63,768.80

One year's operation under these conditions would pay for the furnace, and save over $3,000.00 beside. As the $16.20 per ton interest and depreciation of "Equipment Engineer's" figures is now written off, the furnace can now go on melting at $15.24 per ton against the coal fires $17.70, thus saving $12.30 per single shift day whenever it is used, and costing nothing when idle. All these are hypothetical cases, but it is interesting to see where your correspondent's figures lead us if we vary the conditions, as this brings out more clearly where his comments apply and where they fail.

As to conservation, your correspondent speaks of "gas or oil" in several places. With the urgent need of the Navy merchant marine for fuel oil, he is a poor conservationist who would use fuel oil in a brass furnace when he can use electricity from bituminous coal.

We may leave out the coming use of water power for generating electricity until we get general inter-connection of steam and hydraulic plants, which is coming but is not yet here to much extent, though not forgetting that when water power is available the electric brass furnace will be the truest sort of fuel conservation.

The most efficient power plants can deliver a K.W.H. for 2 lbs. of bituminous coal. At 300 K.W.H. per ton, this is 600 lbs. per ton of brass melted against your correspondent's figure of 800 lbs. of anthracite per ton of brass. At 225 K.W.H. per ton the electric furnace uses 450 lbs. of bituminous.

Including inefficient power plants, the average is not less than a K.W.H. for 3 lbs. of coal, which means 900 lbs. or 675 per ton of brass according as the electric furnace is operated to use 300 or 225 K.W.H. per ton.

Electric furnaces, operated 24 hours per day can melt yellow brass under the most favorable conditions at 175 to 225 K.W.H. per ton, and when this is converted into B.t.u. and compared with the best efficiency of fuel-fired furnaces, it will be found that neither coal, coke, oil nor gas is capable of doing the work at so low a figure. A small electric furnace of an inefficient type, intermittently operated, may take 600 K.W.H. or more per ton, and it is not good conservation to use such a furnace in such a way, though it may be justified by costs under some conditions.

The situation in a nut shell is that a plant melting large amounts of brass or bronze can normally do it most cheaply in the electric furnace. Plants melting very small amounts may do it more cheaply by electricity or by one of various fuels, depending entirely on local conditions which should be carefully gone into before a decision is made.

If "Equipment Engineer's" letters cause plants of the latter class to go carefully into all details before choosing an electric furnace, or a fuel-fired furnace, they will have served a useful purpose. That they should deter anyone who can save by installing an electric furnace would be as regrettable as it is unlikely.

One word more as to "standardized furnaces." There are enough types and sizes of furnaces, both electric and fuel-fires on the market, to cover the great bulk of the melting needs, and it will generally be cheaper and more satisfactory to use one of these that has been proven in use than to allow some consulting engineer to exercise his fancy in the construction of a "special" furnace. The furnace should be **chosen** to suit the work, from those of proved design.

Respectfully,

H. W. GILLETT,
Chief Alloy Chemist.

U. S. Bureau of Mines, Ithaca, N. Y., May 17, 1921.

MR. EASTICK'S OPINION

To the Editor of THE METAL INDUSTRY:

Referring to the article on "New Types of Electric Furnaces," in the April number, describing the two muffled arc type furnaces developed by the General Electric Company, the statements contained therein warrant close critical examination. Before doing so, however, it seems desirable to point out some weak features of the design of the furnace.

It is mentioned that the 1,500 lb. furnace melts yellow brass, pouring at 1,100 deg. C., at 270 K.W.H. per ton, operating 24 hours per day, with one heat every hour.

Presumably 24 hour operation is necessary on account of the complicated and weak nature of the hearth construction and electrode muffles, which, with intermediate operation, would speedily fail and necessitate frequent re-lining. In any case the cost of re-lining with the necessary shut-downs, must be high and cannot but materially increase the cost per pound of metal melted.

Another feature of the furnace which would bar its use under most conditions is the apparent impossibility of stirring the metal.

270 K.W.H. per ton at, say, 2.5 cents per K.W.H., is 1/3 of a cent per lb. which is a poor showing against 1/6 cent per lb. for coal with crucibles and ⅛ cent per lb. with oil in a tilting reverberatory furnace.

The performance of the 50 lb. furnace (not stated in the article) must be even worse on account of the much smaller capacity.

The statements contained in the last three paragraphs are entirely misleading and erroneous. High Zinc losses are due to manipulation, not to furnace or fuel. This is a subject which electric furnace promoters continually harp on and in many cases much dust has been thrown in the eyes of engineers and foundry owners. Zinc loss from brass increases with the temperature of the molten metal and with the time the metal is maintained at a given temperature. "Electric" furnaces cannot affect the volatilization of zinc in any way. The presence or absence of oxygen or any other gas does not affect the rate of volatilization, and it is therefore entirely erroneous to say that high metal losses are due to "combustion" or "gases," etc. There are just two factors governing zinc loss, namely, temperature and time.

The following statement is contrary to all metallurgical fact and to practical operating experience:

"In brass melting for instance, it is very difficult to obtain the proper atmosphere and temperature inside the

fuel furnace, with the result that the zinc is either oxidized by the gas, or volatilized by too great heat. The same is true of other metals used as alloys, such as tin, or lead, all of them being readily oxidizable at the temperature necessary for melting and pouring. In fact the metal loss of the fuel fired furnace is in the neighborhood of from 2.5% to 8%, as against 1.5% to .75% for the electric, depending on the metal."

It is hard to use temperate language to point out the utter lack of metallurgical knowledge and experience exhibited by the writer of such a passage.

The statement that the metal loss in "fuel fired furnaces" is in the neighborhood of from 2.5% to 8%, is without any foundation and is really worthless. It is not possible to loosely classify "fuel furnaces" and compare them with "electric furnaces," either with reference to zinc loss or any other point, and a discussion on such a basis is absurd.

Getting back to the losses of 2.5% to 8% however, a foundry or casting shop losing up to 8% with crucible pit fires or tilting oil or gas furnaces is certainly in a bad way and the writer would undertake to correct the condition and reduce their loss to reasonable limits in a few days if given a free hand.

The statement in the last paragraph regarding thermal efficiency is also absurd. It should be perfectly obvious to anyone that the author of this statement is, in the case of the fuel fired furnace, comparing the efficiency from fuel to metal melted and in the case of the electric furnace, from current in-put to metal melted. What would the "thermal efficiency" of the electric furnace be if we consider coal to electricity and then electricity to metal melted? The efficiency of a steam plant is, say, 15% (from coal to power) and the furnace efficiency is 50%; the net efficiency in this case would be 7.5%. Many types of fuel fired furnaces are more "efficient" in this respect.

It becomes more and more apparent that the development of methods and equipment for the melting of metals is primarily a metallurgical problem to be solved only through the cooperation of the metallurgist and the furnace engineer. It cannot be left to the electrical engineers; they naturally start off with the assumption that electricity must be, and is, the only "efficient," "controllable" source of heat and they then proceed to build a piece of electrical apparatus instead of a furnace to economically melt good brass.

THOS. H. A. EASTICK.

Montreal, Canada, May 12, 1921.

Electric Furnaces for Non-Ferrous Metals*

By H. W. GILLETT

A tabulation in great detail of all the electric furnaces now in operation in the United States melting non-ferrous metals, giving the kind of furnace, users, capacity per heat. There are 323 in 144 different plants with a capacity of 193 tons per single heat and using 42,350 kw. Also a tabulation of the composition of the alloys worked in the different furnaces and the special work for which each type is adapted.

Applicability of Various Types of Electric Furnace to Various Alloys*

Alloy Analysis									Types of Furnaces						
Fe	Cr	Ni	Cu	Sn	Pb	Zn	Ag	Al	Direct Arc	Stationary Indirect Arc	Moving Indirect Arc	Reflected Heat	Contact Resistance (Bennett)	Vertical Ring Introduction	High Frequency
..	15	85	..	..	..	..	..	..	O.K.	O.K.	O.K.?	?[1]	?	?	O.K.?
5	..	67	28	..	..	..	..	..	O.K.	O.K.	O.K.	?[1]	?	?	O.K.?
		25	75	..	..	..	..	..	?[2]	O.K.	O.K.	O.K.	O.K.?	?	O.K.?
		5	95	..	..	..	..	..							
			100	..	..	..	..	..	?[2]	O.K.	O.K.	O.K.	O.K.	No[4]	O.K.
			90	10	..	..	..	..	O.K.	O.K.	O.K.	O.K.	O.K.?	?[2]	O.K.
			88	10	2	..	..	..							
			80	10	10	..	..	..							
			76	3	18	3	..	..	O.K.[3]	O.K.	O.K.	O.K.	O.K.?	No[4]	O.K.
			68	4	26	2	..	..							
			85	5	5	5	..	..	No[5]	O.K.	O.K.	O.K.	O.K.	O.K.	O.K.
			74	4	5	17	..	..							
			80	..	..	20	..	..							
			70	..	..	30	..	..							
			67	..	3	30	..	..	No[5]	No[5]	O.K.	O.K.	O.K.	O.K.	O.K.
			61	1	..	38	..	..							
			65	..	1	34	..	..							
			60	..	..	40	..	..							
		18	58	..	..	24	..	..	No[5]	No[5]	O.K.	O.K.	?	O.K.	O.K.
			3	..	..	15	..	85	No[5]	?[2]	O.K.	O.K.	?	?[2]	O.K.
			2	..	..	30	..	68							
			8	..	..	..	..	92	?	O.K.?	O.K.	O.K.	?	?[2]	O.K.
			10	..	..	..	90	..	?	O.K.	O.K.?	O.K.?	?	?[2]	O.K.
			10	..	..	85	..	5	No	No[5]	O.K.?	O.K.	?	?	O.K.?

O.K. = Furnace metallurgically satisfactory for this alloy.
? = No data on hand.
O.K.? = Probably satisfactory, but no record of trial.
No = Furnace not satisfactory for this alloy.
[1]Temperatures probably rather high for good refractory life.
[2]Question of copper poisoning by fume from direct arc not yet settled.
[3]Induction furnace on this alloy would require resistor tube of special design.
[4]Lead too high for good life of usual lining of induction furnace.
[5]Furnace causes loss of volatile metal from this alloy.

Reduction by Means of Silicon*

By LOUIS KAHLENBERG and WILLIAM J. TRAUTMANN

After a review of the work done in this field, the authors describe their own experiments. Silicon powder containing 95 per cent Si and 5 per cent Fe was used, ground to a fine powder. The substance to be reduced was mixed with the silicon and either (1) heated in a glass tube over a gas burner, or (2) put into a crucible and ignited by a primer of potassium chlorate and magnesium, or (3) ignited in a crucible by two silicon points between which an electric arc was produced.

*From papers read at the meeting of the American Electro-Chemical Society in Atlantic City, N. J., April 21-23, 1921.

Annular Cracks

A Discussion of the Various Theories Accounting for Their Formation—Conclusion*

Written for The Metal Industry by R. R. CLARKE, Foundryman

EFFECT OF POURING TEMPERATURE

Regarding pouring temperature conflicting claims are made, some regarding hot metal, others holding cold metal responsible. Personally I could never discern the connection between cold metal and a solid casting. My experience is against it. Yet in all I have ever said concerning high temperatures I have faithfully endeavored to observe the conservative sense of the term. I have always been fully aware of rapid oxidation and volatilization. The physical weaknesses of cold metal are well known. Its viscosity is a certainty. It reduces pressure and defeats compact association, instead of floating dross it includes it and rather than helping union it opposes it. If an oxide film or "scum"—which might be considered incomplete oxidation—is anywhere plainly apparent it is on the surface of cold metal. On the surface of hot metal the complete oxide or dross appears in free state and this, insofar as partition in the casting is concerned is far less menacing than the film or scum. It is perhaps for this reason that large half-bushings when poured cold disclosed serious longitudinal lines of imperfect union or suture while those poured hotter completely escaped the condition.

In different respects the annular crack resembles pin holes in a casting from the gate and those shrinkage ruptures sometimes showing in heavy castings as well as those between variable of bulk. Now, we know that cold metal is conducive to those ruptures. How it could operate to produce them in the one case and so completely suspend as to prevent them in the other is hard to understand. A molder explained it once on the hypothesis that the metal set so quick it had neither time nor opportunity to part. Evidently he overlooked two facts, namely, that one natural law acts as inevitably as another and that no matter how low the pouring point, metal to any degree hotter would have to pass that point in solidifying in the mold.

The theory of metal property is based on the relative prominence of shrinkage and of cohesion in different metals, and in different grades of the same metal. Briefly the contention is that the rupture originates in the cooling strains and that wherever shrinkage is high or cohesion in the plastic mass for any reason weak, the difficulty will naturally prevail, comparing yellow brass (Cu 66 2/3, Zn 33 1/3) with red brass (Cu 85 Zn 5 Sn 5 Pb 5) we find a wide margin between them, shrinkage being higher and cohesion lower in the yellow metal. One might guess therefore that the yellow metal will develop an annular crack much more frequently and severely than the red metal. This conclusion we might say is in accord with experience. Now if from any cause we widen these margins, as for instance we lower cohesion by using poor grades of metal or by oxidation, we can theoretically anticipate a corresponding effect in the results and this, too, agrees with experience. (The term "cohesion" is used to express the capacity of metal to adjust or compensate shrinkage rather than the power to resist it.) The theory is a practical common sense proposition. On different occasions we have been compelled either to lower the zinc or build up the metal in order to get away from the trouble.

Unequal congelation is another well-premised argument derived from the principles of radiation, of congelation and of contraction.

*Part 1 was published in our May, 1921, issue.

Primarily these points are: First, congelation increases in speed with radiating surface; second, congelation increases in speed with hardness of surface; third, shrinkage is localized with unequal rates of congelation. The second proposition may appear doubtful but is readily established by the fact that metal poured in an iron chill solidifies much more rapidly than in a mold and by the further fact that, in thin castings, metal almost invariably fails to run satisfactorily over hard-rammed mold surfaces regardless of the venting.

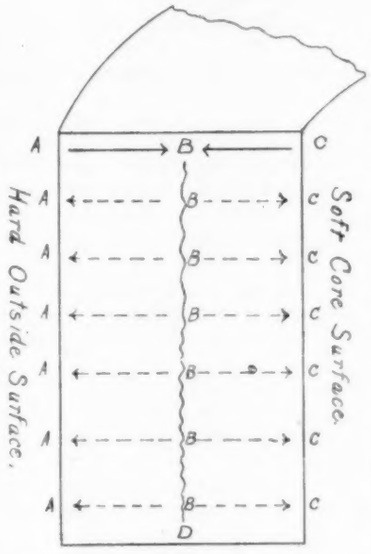


FIG. 11. A STUDY IN UNEQUAL CONGELATION.

In Figure 11 congelation occurs from A to B and C to B, being more rapid in the former than in the latter. The "drains" of congelation, however are the reverse or from B to A and C to B, being heavier in the former. The result of these opposite and unequal drains is a marked depletion in the inner liquid or plastic mass and the cleavage line B-D, begins to show. At final concretion the A-B or outside section of the wall draws back as does also the B-C or inside section each taking a quota of what little plastic metal remains. Final shrinkage then distributes the discrepancy according to the conditions and leaves the annular crack. The theory of oxide film partition regards the oxide film as accompanying congelation to B-D and interposing union of the two surfaces of congelation. The two theories acting in concert would constitute a bad combination.

CONCLUSION

We are now ready for the argument. In thin bushings molded upright with green cores, the outside surface is greater than the inside surface. In correct molding it is also harder than the inside or "core" surface. Congelation in the metal wall is therefore more rapid from outside inward than from inside outward. In the process of solidification a line of partition therefore is early indicated becoming more and more distinct with the approach to final solidification. At the point of final settling the congealing surfaces communicate imperfectly by a web of plastic metal, when by contraction the walls settle back and apart, each one taking its quota of the web metal. Final shrinkage then distributes the discrepancy according to the conditions, showing it in some places as a mere line of fracture, in others as the open breach. The tendency of the rupture to locate closer to the inside than the outside circumference, the indication of strains diametric and opposite to each other, the significance of high shrinkage and low cohesion; these and different other features combine to block the way to contesting argu-

ment. To the flat disc or plate the theory is equally applicable for there the drag surface is invariably the harder and has the advantage of the longer period to congeal. The fact is that unless multiple gates were cut the full depth of the mold to maintain uniform circulation in the mold, the formation of a plane of partition would not be altogether unlikely, regardless of relative hardness in surfaces. To the objection that the annular crack develops around the hard, dry core, the answer is that the radiating surfaces remain the same as in the green core, that its hardness is or ought to be a mere surface feature and that its dryness helps compensate its hardness.

A parting glance at the foregoing theories reveals that one recognizes chemical action, another both physical and chemical causes, while the rest are concerned chiefly with physical forces. That the annular crack in its various forms is principally a phenomenon of shrinkage, we have absolutely no doubt. Yet I am equally convinced that shrinkage alone could not produce its diversified examples.

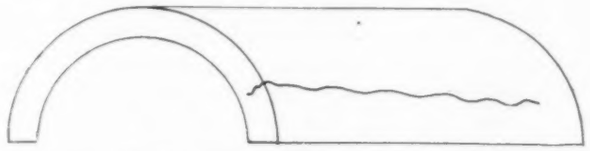


FIG. 12. LONGITUDINAL CRACK PRODUCED BY COLD POURING ALLOY. USED CU, 87—SN, 8—ZN, 5.

At any rate, in combating it we have found that good molding, careful melting, correct pouring and a deep regard for metal properties are all factors of prime consideration.

Cleaning and Copper-Plating in the Same Solution*

By WILLIAM McKEON

This paper has been written merely to bring to your attention the possibilities which such a solution offers on iron and steel products where increased production, reduction in the number of operations and labor costs are the greatest factors.

Shells of varying shapes and sizes of cold rolled steel are being cleaned and plated in this solution daily with most satisfactory results, both in the quality of the finish and the quantities produced.

The tank is of iron, with as many anodes hung on the side of the tank as possible. This is the positive pole. The cathode bar lies along the middle of the tank and is insulated from it. An insulated steam coil completes the equipment of the tank. It is desirable to have the tank covered with a hood and this connected to a suction fan to remove the fumes.

The anode surface (tank plus anodes) has approximately 56 square feet. The work surface runs approximately 17½ square feet. Five volts are being used and the current density runs about 25 amperes per square foot. A batch of work is cleaned and plated in the short space of two minutes; then rinsed, dried, colored and lacquered.

Normally, the work comes to the plating room with a heavy coating of oil and drawing soap upon it. There is no difficulty encountered from this source. Slightly rusted work and some with a sort of scale do not interfere with obtaining a good deposit. Badly rusted, heavily scaled work, or pieces with oil burned on, are pickled first; only occasionally has pickling been necessary. The work having a coating of carbon is the only condition which causes blistering.

The formula is as follows:

Caustic soda	8	ounces
Soda ash	6	"
Water glass	1	"
Copper cyanide	4	"
Water to make	1	gallon
Sodium cyanide	7½	ounces
Temperature	200°	Fahr.

The upkeep of this solution requires additions of copper and sodium cyanides and caustic soda from time to time. The cyanogen broken up by the high temperature is naturally large, and additions of sodium cyanide are required oftener; but the increased production more than offsets the cost of the cyanide. This new way produces more work than two 350-gallon solutions did previously.

The most important feature in copper-plating in this manner and one which should appeal very strongly to the foreman in these times of unrest, is the fact that plating of this nature does not require a skilled operator to get out the work.

It has been found, from our experience, that if the solution contains approximately 3 ounces of metallic copper and 2½ ounces of free cyanide per gallon, the oils and dirt will be cut from the work almost instantly, leaving a good, smooth, adherent copper deposit.

*The Monthly Review, January, 1921.

Refining Gold Sweeps

By H. D. COLEMAN*

Q.—What is the best way to refine sweeps and polishings? We would like to know what is the best flux to be used in melting.

A.—If sweeps are known to contain much iron use equal parts of fused borax mixed with nitre. Otherwise use ⅓ volume of nitre to ⅔ volume of fused borax.

Mix the above fluxes well with sweepings, filings and miscellaneous waste. Use a crucible giving ample volume for swelling and agitation by this mass when subjected to heat. In other words fill the crucible not over three-quarters full. Put crucible on fire and heat until the mixture is extremely fluid. Stir well and heat further for 15 minutes or more. Then cut off heat and let crucible slowly cool. Do not attempt to pour mass into a mold, for some granules will be held up in the flux on top. Let crucible stand after removing from the furnace until entirely cool, which may take several hours. Finally break crucible, knock off flux and king of precious metals will be found at the base.

Such a button can be deposited at any of the mints or assay offices of the government and will be received provided the value is $100 or over and the base is not 800 parts per 1,000.

If it is desired to acid refine this bullion, special equipment will be necessary, and unless equipped for same, making a deposit of such a button would be the better way of realizing the values therein. The mint charge would be one dollar for melting and a small alloying charged, depending on the purity of the deposit, or a refining charge. H. D. C.

*Superintendent of Melting, U. S. Mint, Philadelphia, Pa.

Interchangeability of Machine Parts

Errors Due to Improper Machining, Unreliable Materials, Heat Distortion and Stresses, Relieved and Unrelieved

Written for The Metal Industry by WILLIAM H. PARRY

We have often been told of the ideal assembling room or erecting shop that does not include either files, scrapers, measuring devices or emery cloth as part of its equipment, so perfect are the parts made in the other departments, that all the assemblers have to worry about is pay day. Life must be one sweet song in such a department where the wicked cease from troubling, and the weary are always at rest. That machine parts can be and are made so accurately that nothing is left for the assembler to do but assemble, cannot be gainsaid, but, for every one organization where this practice obtains, there are ninety-nine others who, while they make a stab at it, fall far short of producing interchangeable machine parts.

Theoretically, the manufacture of machine parts that interchange seems to be an easy task, if you will listen to the vaporings of the theorist who glibly expatiates about the various measuring devices that are used in the production thereof, while scorning to mention that even the most precise instrument has its limitations if not kept in the best repair and handled by men who know the difference betwen a micrometer and a pair of ice tongs. While admitting the necessity of gages to insure accuracy of parts, in the final analysis the importance of the many machining operations must always be kept in mind, particularly if the so-called automatic or semi-automatic machines are used. Although these machines will, if in good order, and their tool equipment kept sharp, produce good work, they can without notice produce a lot of worthless junk. Accurate work cannot be produced in quantity by inaccurate machines.

The selection of metals with variable co-efficients of expansion is a frequent cause of inaccurate workmanship as one metal will stand up to the machining operations without the generation of any destructive heat, while another, though similar in appearance, will lose its sizes and sometimes its shape, under exactly the same conditions. Any concern that numbers a hard rubber piece as a component part of their machine, is in for a lot of trouble if they guarantee its accuracy, as no material used is so unreliable and susceptible to temperature changes. Assuming that you do use a vulcanized rubber part of your machine, and a moving one at that, let me tip you off as to what you may expect if another material is not substituted in the meantime.

Pistons of most water meters are made of hard rubber, as one of the **grand** secrets of the trade is to use a piston material of about the same specific gravity as water. This feature of the game came most naturally many years ago, before the "compounder" became the whole works at the rubber factories, his duties being in the main, to eliminate as much rubber by the substitution of asphalt, peat, sand, tar and judy paste, as possible. That the compounders have been very successful in this line of high and mighty endeavor, is evidenced by the specific gravity of water meter pistons more nearly approaching that of granite, than of unity, which is water.

All, all, would be forgiven if the darn things would only hold their size and shape after a lot of expensive machine work had been wasted on them, but, sad to relate, after being stored in the stock room but a comparatively short time, they emerge therefrom lacking in dignity, poise, aplomb, shape and size. Rough turning rubber pistons and storing them in a heated room is often resorted to in the hope that after being thus cured, they will maintain their respectability until such time as they get into the shipping clerk's clutches, but, believe me, that selfsame shipping clerk has got to make some pretty nimble moves if he hopes to beat compounded hard rubber, when it starts on its way.

So we shall wind up the hard rubber end of this yarn by saying that it and accuracy are as far apart as Harding and Debs are in their political beliefs.

The measuring chambers of the mutating piston type of water meter will serve to illustrate an instance of the cussedness of inanimate objects. Although they are usually made of cast brass of a fairly stiff cross section, machined with the utmost care, such a thing as absolute accuracy is a rare occurrence in the finished article, by reason of the peculiar design of their inlet and outlet ports which pass the lathe tool many times during the roughing, semi-finishing, and finishing operations. Between these lathe operations the piece is allowed to cool off so that the distortion due to heat and the jumps across the lathe tool will have time to set. Yet, though the finishing cut rarely exceeds a thousandth of an inch in depth and the feed is fine, a certain amount of hand scraping is necessary on these parts.

On the various makes of type-casting and type-setting machines where the multiplicity of moving parts is almost beyond belief, it can be realized what a task it must be to produce them when the permissible errors are all but nil on each and every part from the keyboards upwards. A visit paid to the factories manufacturing these type-casting machines reveals many surprises to the most hardened and seasoned mechanic, the very least of which are the piles of rejected pieces in evidence in almost every department. This is not written in a spirit of criticism of such establishments (as their organizations are of the finest) but to prove that vigilance of the eternal brand, ably assisted by measuring devices that are kept in prime condition is the price to be paid for accurate work.

There are certain classes of machine work that cannot be so accurately produced that can be assembled without fitting. For instance, take a four or six-cylindered gas engine of the upright type, with the bearing brasses bored out in their housings rigidly bolted to the base, and the one-piece crank-shaft turned ever so carefully in the lathe, one would think that a good fit would be the result. As a matter of fact, judging by the amount of scraping necessary to get the desired contact, a very poor first fit is always the case.

The chief cause for these conditions lies in the crank-shaft itself, as each successive machining operation releases some stress in either the pins, cheeks, or main shaft, and sometimes in all three, so that distortion takes place even when the crankshaft is turned twice, once to release the stresses, and once more to take them out. The automobile crank-shaft makers get over most of this trouble by heat treating, thus releasing the stresses before any machining operations are started. It might not be a bad scheme to subject the cylinder blocks of auto engines to the heat-treatment, so that they will not close in at the top of the bores after running awhile, due to the great heat generated by the explosion of the charges and the escape of exhaust gases. The auto engine makers meet this difficulty by relieving the upper ends of the pistons, and as they get away with it, what's the odds.

In fact the auto engine designers get away with a lot of "rough stuff." For instance, they water jacket the cylinder block to keep it cool, then bolt on an exhaust manifold that at times becomes red hot. This practice I would call changeability, not interchangeability.

Iron-Pot Melting Practice for Aluminum Alloys[1]

A Series of Articles Giving a Complete Survey of Present Day Methods in General and a Detailed Investigation of Iron-Pot Practice in Particular. Part 2.

By ROBERT J. ANDERSON[2]

Lea[4] has discussed the melting of aluminum alloys for foundry work, and some excerpts from his remarks will bear repetition here. Lea states that cleanliness in melting is highly essential, and that the melting pots, whether plumbago crucibles or iron pots, should be kept clean. There are hardly sufficient data available to say precisely and definitely what is the effect of rapidity of melting, or of allowing the metal to "soak" for some time before being poured. If metal is run down very rapidly, it must of necessity mean a very hot furnace, and there is danger of the bottom of the pot getting very hot, and of some of the metal reaching a high temperature. With reasonable care, however, even with a very hot furnace, this danger can be avoided. With such an expensive material as aluminum, and considering the care that has to be exercised in the preparation of molds and cores, it clearly will not pay to run any risk in melting the metal which might in any way endanger the finished casting. The cost of actually melting the metal must always be relatively small, and the saving due to increased speed of melting is still smaller, as compared with the cost of the raw material and of the preparation of molds and cores; therefore, if, by paying increased attention to the melting conditions, the foundry scrap can be in any way diminished, it is clear that economy will soon be effected. If the temperature of all the metal can be kept during the whole of the melting below a certain temperature, there is not much danger; but if in prolonging the heating, it exceeds that temperature, the rapidity of oxidation is greatly increased, and the risk of reduction of silica from the crucibles and of the dissolution of iron from melting pots and stirrers is facilitated.

Lea states further that whether high temperature melting encourages the absorption of gases, or whether gases such as nitrogen or the products of combustion from a coke, gas, or oil fire are more easily absorbed, are matters for investigation. It is clearly difficult to control the air and gas in a furnace so that the final products of combustion shall contain no free oxygen, and of necessity they must contain a considerable proportion of nitrogen. If, as in many furnaces, the gases are allowed to pass over the surface of the metal, oxidation may take place, and either nitrogen or carbon dioxide may be occluded in the metal. If the products of combustion are prevented from coming in contact with the metal (as in iron-pot melting), but air is admitted, then oxidation may take place and nitrogen may be absorbed. The possibility of melting under a vacuum upon a large scale is a very doubtful commercial proposition, but it is probable that melting in special pots which can be easily covered and thus protected from the hot gases and partially protected from the atmosphere (covered iron pots, for example), would reduce any risk of gas absorption and also probably oxidation to a minimum. Certainly, the metal could more easily be kept free from dirt and dust. There may be a possibility of hydrogen being absorbed by decomposition of steam, or from other sources, during the manufacture of the virgin metal, and this may affect the final alloy. Whether by mechanical or chemical means or by "soaking," these gases can be eliminated is a matter for inquiry. The foregoing remarks by Lea indicate a clear appreciation of the problems involved in melting aluminum alloys.

STATIONARY IRON-POT FURNACES

A stationary iron-pot furnace using natural or other gas as fuel has been described[5]. This furnace was one of the first of the iron-pot furnaces put upon the market for melting light aluminum alloys. The furnace consists of a cast-iron shell lined with high grade firebrick, the metal being melted in a thin cast-iron pot by means of natural or artificial gas. Air under a pressure of 2.0 pounds is used at the burner. The capacity of the furnace is given as 225 pounds of aluminum, and the time required for melting down such a charge as 45 minutes. The furnace is run with a cover over the iron pot, and the pot is coated on the inside with a special preparation that increases the life and prevents alloying of the iron with the aluminum. It is stated that about 10,000 pounds of metal can be melted per pot, or a life of about 44 heats. With natural gas at $0.30 per 1,000 cubic feet, the cost of melting 100 pounds of aluminum is given as $0.07 for gas alone. This furnace is to be run in single units.

Iron-pot furnaces of the stationary and tilting types made by the Monarch Engineering and Manufacturing Company, Baltimore, Md., have been described.[6]

The use of stationary iron-pot furnaces in a large foundry has been described[7]. Pit furnaces were formerly used in this foundry; it is stated that these were not discarded because of lack of efficiency but because the oil- and gas-fired iron pots melt at a greatly reduced cost and no crucibles are required. In an installation of three furnaces, the pots are made of gray cast iron, flanged at the top where they rest on the furnace body. Outlets for the products of combustion are provided by steel tube nipples, tapped into the furnace body close to the top, taking elbows pointed downward. Vent pipes leading outside the building are connected with the outer shell which carry off the furnace gases. The top of the pot is covered by a horizontal firebrick lid, closely fitted to protect the metal from air and other oxidizing influences. The furnaces are fired by both natural and illuminating gas, mixed, with air at 1 pound pressure. The metal is melted continuously, each pot having a capacity of about 250 pounds. Owing to the high temperature to which the pots are subjected, they must be replaced about every two weeks, and the slightest defect in the gray iron casting frequently results in a break-out after a few heats.

In the discussion of the Report of Official Chemists of the American Institute of Metals[8] in 1912, the question of melting practice for aluminum alloys was briefly dealt with. In the discussion, Gillett states that the oil-

[1]Published by permission of the Director, U. S. Bureau of Mines.
[2]Metallurgist, U. S. Bureau of Mines, Experiment Sta., Pittsburgh, Pa. Part I was published in our May, 1921, issue.
[4]Lea, F. C., The founding of aluminum, The Metal Ind. (London), vol. 15, 1919, pp. 509-511; abst. of paper before the Royal Aeronautical Soc., April, 1919.
[5]Anon., The Cleveland aluminum furnace, The Foundry, vol. 30, 1907, p. 313.
[6]Anon., Soft metal melting furnaces, The Metal Ind., vol. 6, 1908, p. 187.
[7]Anon., Production of aluminum castings, The Foundry, vol. 33, 1908, pp. 139-144.
[8]Woods, C. F., Report of official chemists of the American Institute of Metals, Trans. Am. Inst. of Metals, vol. 6, 1912, pp. 1-11; and discussion pp. 11-43.

fired iron-pot furnace is preferable for aluminum alloys because the flame or products of combustion do not come into contact with the metal. It was brought out that cast-steel pots are useless for aluminum alloys, and that cast-iron pots were preferable. The following two analyses of cast-iron pots were given:

ANALYSES OF TWO CAST-IRON POTS.

Reported by	Elements, per cent.						
	T.C.	G.C.	C.C.	Mn	Si	S	P
HORNE	3.20	2.40	0.80	0.35-0.40	1.0-1.25	0.05-0.08	0.28-0.32
GILLETT ...	3.33	3.15	0.18	0.59	3.03	0.08	0.56

An installation of ten oil-fired stationary iron-pot furnaces has been described.[9] Each pot has a capacity of 165 pounds, and about 12 heats are taken off per day, making the daily production about one ton per furnace. In the construction of the furnaces in this installation, an oil-burning nozzle is set close to the furnace shell, the air being carried into the combustion chamber through a pipe surrounding the nozzle. The burners are set tangentially to the furnace wall so that the flame will be given a whirling motion around the pot. The pots are cast from semi-steel, made up of 40 per cent steel scrap and 60 per cent foundry iron. It is stated that the object of using this mixture is to make a pot which will have a dense structure. These semi-steel pots are said to last for 150 to 200 heats.

Lea[10] states that, in the use of cast iron-pot melting for aluminum alloys, coatings should be applied to the interior of the pot surface, frequently and regularly. The composition of the coating to be used is not given.

The use of stationary oil-fired iron-pot furnaces of 300-pounds capacity at the McAdamite plant of the General Aluminum and Brass Manufacturing Company, Detroit, Mich., has been mentioned[11], but no details are given.

Reardon[12] states that while the common practice for melting aluminum alloys is by the use of iron pots, and while this method may be the right way, the method is both costly and wasteful.

TILTING IRON-POT FURNACES

Barnes[13] has mentioned the use of oil-fired tilting iron pot furnaces in a foundry for melting aluminum alloys. In these furnaces, the melting loss is given as 2.5 per cent. A concentric burner is used, with compressed air at 35 pounds per square inch for atomizing the oil; the oil is supplied at about 25 pounds pressure at the nozzle. Both the oil and air are pre-heated by suitable means before they issue from the nozzle. The volume of air for combustion is supplied through a truncated nozzle surrounding the concentric portion of the burner, and is maintained at about 8 ounces pressure. The atomizing air, oil, and combustion air are controlled by valves and gates so as to maintain a reducing atmosphere whether a slow or fast fire is desired.

Prentiss[14] has described briefly the melting room at the Detroit plant of the Aluminum Manufactures, Inc. This is equipped with tilting iron-pot furnaces, fired by oil, and arranged in two rows on each side of the room. With the furnaces to be installed shortly, there will be 44 furnaces of this type. Each of these furnaces has an average capacity of 250 pounds per hour, although during tests it is stated that a melt of as high as 400 pounds per hour has been attained. A thermocouple is suspended above each furnace, and is connected to a Wilson-Mauelen Co. indicating pyrometer located in an alcove between the melting room and the molding floor. Another pyrometer is used for taking the temperature of the metal in the bull ladle before being taken to the foundry floor.

The foregoing remarks are simply brief excerpts taken from published articles dealing with iron-pot melting practice for aluminum alloys. As has been stated, there is a considerable paucity of published data on this subject. Turning now to a consideration of the actual construction details of iron-pot furnaces, a discussion of some typical furnaces and their principal features may be considered.

This series will be continued in a subsequent issue.—Editor

[9]Anon., Producing castings for the automobile trade. The Foundry, vol. 41, 1913, pp. 87-92.
[10]Lea, F. C., The founding of aluminum, The Metal Ind. (London), vol. 15, 1919, pp. 509-511; abst. of paper before the Royal Aeronautical Soc., April, 1919.
[11]Anon., Progress in aluminum castings, The Metal Ind., vol. 17, 1919, pp. 211-213.
[12]Reardon, W. J., Electric melting in an oil furnace. The Metal Ind., vol. 18, 1920, pp. 207-210.
[13]Barnes, E. A., Non-ferrous foundry economics and refinements, Trans. Am. Inst. of Metals, vol. 5, 1911, pp. 90-113.
[14]Prentiss, F. L., Modern foundry for aluminum castings. The Iron Age, vol. 105, 1919, pp. 535-539.

Utilization of Scrap and Residues in Metal Foundries

By C. Diegel, from Betrieb, Nov. 10, 1920. P. 62-66—Part 2*.

Abstracted for The Metal Industry by R. E. SEARCH, Exchange Editor

COLLECTION AND USE OF THE REMAINING SCRAP AND RESIDUES

Burnt crucibles are broken up and crushed to powder, and along with that the slag containining some metal. The latter are separated by stone hammers or picks and sold for scrap, whilst the crucible powder is reserved for further use or exchanged for new crucibles.

In the finishing shops the filings, the chips from circular and band saws, and the particles from the grinders are drawn off by a suction apparatus to collect the dust rich in metal. The mixture is much contaminated by emery grindings and is sent to the smelting works to obtain the copper it contains by the electrolytic process. In the same way other sweepings are treated. The dust sucked off from the sand-blast apparatus in the course of time amounts to a great quantity, and contains about 3% of copper the recovery of which is unprofitable.

*Part 1 was published in our May, 1921, issue.

On the other hand the collection of the copper salts arising from the corrosion of metal castings in the pickling baths that contain nitric and sulphuric acids (3 to 1) are saved. In this case, chiefly from the copper nitrate, the salt crystallizes out of the acid and settles at the bottom of the tank. The acid is drawn off occasionally and the crystals are recovered, washed and kept in lead-lined boxes until the copper can be recovered from them, or they are sold.

USE OF SMALL METAL INGOTS BY REMELTING ACCORDING TO SECTIONS 2 TO 5 AND OF THE UNREMELTED OLD METAL OR SCRAP ACCORDING TO SEPARATE ANALYSIS

Giving preference to the portions extracted from the analysis book from the instructions sent out for sorting in the foundry, the manipulation is briefly outlined. Under *a* to *d*, in the table below, for a part of the admixture of pure copper according to the necessity, phosphor cop-

per is substituted. Under *e* the content of 0.8 per cent. Fe. is harmless. The casting of alloys which are contaminated by aluminum is for the most part not recommended, because, by reason of the presence of aluminum oxide which is not entirely removed, the castings turn out unsound. Also with a small amount of aluminum the small pigs are colored a golden yellow. Such pigs are sold to the refineries to obtain the copper they possess.

1. Analyses:

	Cu.%	Sn.%	Zn.%	Pb.%	Fe.%	As.%	Remarks.
No. 2181, old pure hard bronze....	75.3	22.3	0.7	1.4	0.05	0.25	Not remelted.
No. 2197, old pure bronze.....	91.6	8.2	..	0.1	..	0.1	The same.
No. 2300, bronze scrap.....	81.4	10.4	1.8	1.3	0.1	..	Remelted, cast into small ingots.
No. 2319, old gun metal.....	80.4	7.9	9.2	2.4	0.1	..	The same.
No. 2341, bronze chips.....	83.4	11.1	3.9	1.4	0.2	..	The same.
No. 2345, gun metal chips.....	77.3	7.6	13.0	1.7	0.4	..	The same.
No. 3150, hard solder scrap.....	64.6	..	32.8	1.7	0.9	..	The same.

2. Alloys from unknown castings:

	Cu.%	Sn.%	Zn.%	Pb.%	Fe.%	As.%	Remarks.
No. 3 P., earlier self-evident manufactured large castings.....	83.0	14.0	2.5	0.5	..	..	Not remelted and not analyzed.

3. Crucible charges per 100 Kg of good melts:

a. Hard bronze for bearings of spigots.

	Cu.% Kg.	Sn.% Kg.	Zn.% Kg.	Pb.% Kg.	Fe.% Kg.	As.% Kg.	Remarks.
The alloy should be 100 Kg.....	81	17.7	..	1.3	..	..	
It is to be alloyed with 70 Kg. castings No. 3 P.....	58.10	9.80	1.75	0.35	..	..	On hand are 3,460 Kg.
7.2 Kg., old hard bronze No. 2181..	5.43	1.60	0.05	0.10	..	0.02	On hand 358 Kg.
To this add new metal.....	17.47	5.85	..	0.85	..	..	
Result 101.37 Kg.....	81.0	17.25	1.8	1.3	..	0.02	0.45% Sn. by 1.8% Zn substituted.

b. Gun metal for castings which must resist high pressures (made from pure alloys).

The alloy to be 100 Kg.....	Cu.% Kg.	Sn.% Kg.	Zn.% Kg.	Pb.% Kg.	Fe.% Kg.	As.% Kg.	Remarks.
	84.5	8.5	6.0	1.0	..	..	
It is to be alloyed with 60 Kg. bronze No. 2197	55	49	..	0.05	..	0.05	
30 Kg. small pigs, No. 2300.....	25.92	3.1	0.55	0.40	0.03	..	
To this add new metal.....	3.58	0.5	5.45	0.55	..	..	
Result, 100.08 Kg.....	84.5	8.5	6.0	1.0	0.03	0.05	

c. Gun-metal for castings with low internal pressure which can be made from old metal and small ingot chips.

	Cu.% Kg.	Sn.% Kg.	Zn.% Kg.	Pb.% Kg.	Fe.% Kg.	As.% Kg.
The alloy to be 100 Kg.....	84.0	8.5	6.0	1.5	..	..
It is to be alloyed with 50 Kg. of small ingots, No. 2139.....	40.20	3.95	4.60	1.20	0.05	..
40 Kg. of small ingots, No. 2341..	33.36	4.44	1.56	0.56	0.08	..
To this add new metal.....	10.44	..	..	..	..	..
Result, 100.44 Kg.....	84.0	8.39	6.16	1.76	0.15	..

d. Gun-metal for castings without internal pressure and without important claims to tensile strength, whose composition is almost the same as that of ingot chips.

	Cu.% Kg.	Sn.% Kg.	Zn.% Kg.	Pb.% Kg.	Fe.% Kg.	As.% Kg.
The alloy to be 100 Kg.....	84.5	8.0	6.0	1.5	..	..
It is to be alloyed with 50 Kg. of ingot chips, No. 2341.....	41.70	5.55	1.95	0.70	0.1	..
32 Kg. of ingot chips, No. 2345....	24.74	2.43	4.16	0.54	0.13	..
To this add new metal.....	18.06	..	..	0.26	..	..
Result, 100.32 Kg.....	84.5	7.98	6.11	1.5	0.32	..

e. Brass to be hot-pressed.

	Cu.%	Sn.%	Zn.%	Pb.%	Fe.%	As.%
The alloy to be 100 Kg.....	58.5	..	40.0	1.5	..	..
It is to be alloyed with 50 Kg. of ingot chaips, No. 3150.....	58.5	..	29.7	1.5	0.8	..
To this add new metal.....	..	..	13.3	..	..	..
Result, 103.8 Kg. as substitute....	58.5	..	43.0	1.5	0.8	..

By remelting and pouring into a chill mold for thin bars, with the loss of 3 Kg. of Zn. There then remained 100.8 Kg.

	58.5	..	40.0	1.5	0.8	..

Remarks: The metal in the slimes could be removed more advantageously by the use of a Wilfley Table or a Frue vanner.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

Published Monthly—Member of Audit Bureau of Circulations

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year :: SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order; Cash Should Be Registered

ADVERTISING RATES ON APPLICATION FORMS CLOSE THE FIRST OF THE MONTH

Palmer H. Langdon.....Editor and Publisher
Adolph Bregman .....Managing Editor
George W. Cooper .....Advertising Manager
Thomas A. Trumbour .....Business Manager

ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
Telephone Number Beekman 0404. Cable Address, Metalustry

Vol. 19 New York, June, 1921 No. 6

Contents

EDITORIAL

ELECTRIC FURNACES VS. CRUCIBLES

The great outstanding question in the world of metals is still the electric furnace. It is for this reason that the letters from Dr. Gillett and Mr. Eastick in this issue are so interesting and important. Dr. Gillett takes exception to many of the conclusions drawn by Equipment Engineer in his letters published in our April and May issues, while Mr. Eastick objects to the statements in the description of the new General Electric furnace in our April issue.

The position of THE METAL INDUSTRY in this controversy is simply that of a medium through which both sides may speak. Our interest lies in the manufacture of metals, and from this point of view electric furnaces, crucibles and all other appliances have their hearings and must undergo the same scrutiny.

The advent of electric furnaces brings to mind the development of the fluid fuel furnaces, the gas and oil-fired melters. When they appeared, they were to sweep all before them. Coal and coke were to be wiped out; the open-flame furnace was to supplant crucible furnaces everywhere. The fact is, however, that coal, coke and crucibles all survived. Open-flame furnaces and oil or gas fuel found the places where they were useful—but it was not everywhere.

The one industry where electric furnaces have really swept all before them is the rolling mill field. It can be said with safety that the adoption of the induction type of furnace by almost all the large metal mills of the country proves that this furnace is plainly the best for their purpose. That this furnace has certain defects (freely and commendably admitted by the manufacturers) which make it less suitable for intermittent foundry use is also common knowledge.

It seems to be more and more generally admitted that large foundries, doing production work, which can afford the heavy interest and depreciation charges, can use electric furnaces to good advantage—not in every case, perhaps, if they are very unfortunately situated as regards power, but at least in many. The place where the electric furnace is still a problem is the small foundry, which makes up a very large part of the industry. The details of the problem, the pros and cons, need not be recounted here. They are capably set forth in Dr. Gillett's and Mr. Eastick's letter and numerous other articles that we have published. In the meantime we are ready to hear from other experts who have or have not installed electric furnaces, giving reasons for their decisions. To us the important question to be settled about electric furnaces is not "will they work," for it is known that they work well, but "will they pay?"

METAL PLATING

In this issue we publish the last instalment of one of the most remarkable series of articles on electro-plating ever published, Metal Plating (Part 10, Gold Plating), by W. G. Knox. This completes the series.

Metal Plating has made a name for itself and its author as one of the most careful and trustworthy pieces of work ever turned out in the plating field. The information as tabulated has been put into such form that, almost at a glance, it is possible to determine many of the factors necessary for the proper design and operation of a plating plant. Current density, thickness of deposit, weight of deposit and time required have been shown for nickel, cobalt, copper, zinc, tin, lead, cadmium, iron, silver and gold, thus covering practically the entire range of electro-deposited metals.

One prominent electro-plating engineer states that he uses the tables constantly for estimating generator capacities and other plant equipment. Numerous platers have freely commented on the great value to the art of such accurate and authentic data. The plating industry needs such work as Mr. Knox's, and THE METAL INDUSTRY is glad to be the means of bringing it out.

PLATERS' WRINKLES

Another series of note is the revision of Platers' Wrinkles, by C. H. Proctor, founder of the A. E. S. and Plating-Chemical Editor of THE METAL INDUSTRY, completed in our May issue. This material, which is of immense value to the practical plater, will very shortly be republished in pamphlet form with all its additions.

THE PLATERS' CONVENTION

The leading article of this issue gives all the details of the annual convention of the American Electro-Platers' Society to be held in Indianapolis, Ind., from June 29 to July 2. It is decidedly encouraging to see that the depression which still grips the country and which has crippled the plating industry has no effect on the plans of the Society. The enthusiasm with which the regular plans are being carried out is one of the really heartening signs of the strength of the organization.

Everyone connected with the plating industry should attend the convention, not only because 350 are necessary to get rate concessions from the railroads but because of the great value of the meetings. Make it your business to be there.

NEEDS OF THE METAL INDUSTRIES

The National Conference of Business Paper Editors is in communication with Secretary of Commerce Hoover on the subject of how the Department of Commerce can aid the business interests of the United States. The Department embraces a number of divisions including the Bureau of the Census, the Bureau of Foreign and Domestic Commerce, the Bureau of Standards, etc.

THE METAL INDUSTRY requested a number of men prominent in the metal industries to express an opinion of what action should be taken by the Department of Commerce to improve existing conditions, and we herewith print the views of an interested party.

"1. The metal coating industry, which includes electro-plating, polishing, finishing, zincing and tinning, needs more than anything else, technical information. The men in charge of the work are very seldom properly trained, having been taught by the rule-of-thumb method, and generally lack the background to acquire a real understanding of the science of their industry. Eventually, this business may get into the hands of chemists who are even now coming into it, but the process is slow and great waste is incurred by the poor methods and the haphazard way of getting results. What is necessary here is that the platers should have an opportunity to learn their profession (for it should be a profession and not merely a trade) from men who are properly qualified to teach. Much excellent work is now being done by the American Electro-Platers' Society and also by the Bureau of Standards, but, so far as we know, with little co-ordination, and certainly with very limited resources. We believe that the co-operation of these two bodies, aided by the Department of Com-

merce, along the line of schools for platers, would result in an immense benefit to this industry.

"2. The manufacture of white metals, such as solder and babbitt, has grown up from the junk business, that is, the business of gathering waste metals and reclaiming them. Originally this was almost entirely in the hands of itinerant junk collectors, who bought or obtained scrap in more or less legitimate ways and sold to scrap and dross refiners. At the present time the trade has grown up considerably, but is still suffering from its early training. Buying and selling on analysis is not yet the rule, and the principle of 'caveat emptor' still prevails to a surprisingly large degree. A few firms, we believe, are running their business on a sound, honest basis but they are handicapped by competition of the other sort. Details in this matter are too numerous to put in this letter, but if the Department of Commerce feels that it can undertake this matter, we shall be glad to supply them.

"3. Metal foundries and casting plants have improved considerably in the past. Nevertheless, the business is of such a nature that it is possible to run it on comparatively wasteful methods. One source of waste is the ashes and dust which are thrown away because so many small foundries are not equipped to handle them and because the secondary smelter will not take them in the small quantities per unit in which they are produced over the entire country. We believe that this waste totals a very considerable amount.

"4. A great need, which we believe exists not only in the metal fabricating industry, such as rolling mills, cutting-up shops and manufacturing plants, but in the metals producing and other industries, is the need for consumption statistics of metals. Production statistics are very generally known through such agencies as the U. S. Geological Survey. However, no one seems to have a very clear idea of how much copper goes into the various trades or how zinc, tin, lead, etc., are distributed by the time they reach the public. We have had a number of inquiries for just such statistics, but have been unable to supply them. They are unquestionably very hard to obtain, and could hardly be collected by any concern except a government or co-operative agency. There is at present, we believe, a report covering a very thorough survey of the distribution of copper in the hands of what was formerly the Copper and Brass Research Committee, but these figures, valuable as they are, will not serve for very long. They should be gone over periodically and kept up to date. At the present time there is no arrangement for doing this that we know of and we believe that the Department of Commerce could handle such work."

NEW BOOK

"Oil Fuel, Its Supply, Composition and Application," by Edward Butler, M.I.M.E. Fourth Edition. Published by Charles Griffin & Company, Ltd., London, England; J. B. Lippincott Company, Philadelphia, Pa. Price, payable in advance, $3.75. For sale by THE METAL INDUSTRY.

This book is all that the name implies. In fact, it is probably the most complete and thorough work published on the subject—a subject which has been sadly neglected. There is scarcely a technical subject upon which reliable and unbiased text books cannot be secured but this has not been true of the application of Fuel Oil.

The fact that oil is an easy fuel to burn has resulted in a tremendous waste of this valuable commodity due to the disregard in thousands of installations of most of the fundamental scientific principles to which it is just as susceptible as any other fuel or material with which engineers deal.

Probably the most valuable point for the prospective user of this fuel or the manufacture of oil burning appliances is the paragraph (k) on page 118, which reads as follows:

"That the efficiency of oil-fuel plants will be greatly dependent upon the general character of the installation of auxiliaries and fittings, and therefore the work should only be entrusted to those who have given careful study to the matter, and who have had extended experience in burning the crude product. The form of the burner will play a very small part in increasing the use of crude petroleum. The method and character of the installation will count for much; but where burners are simple in design and are constructed in accordance with scientific principles, there will be very little difference in their efficiency. Consumers should principally see that they do not purchase appliances that have been untried, and have been designed by persons who have had but limited experience in operating oil devices."

In addition to this, Mr. Butler intimates elsewhere that most burners are efficient but that their application is not usually efficient—the fire boxes or combustion chambers and the supply systems behind the burners are at fault resulting in a good fuel and a good burner being innocently condemned.

It is impossible to comment upon each separate chapter and item but it should be sufficient to say that the book covers a tremendous field in a very unbiased, thorough, scientific and logical manner. It is a great improvement over an early edition which the writer greatly valued but which someone else also valued and therefore appropriated.

S. D. Rickard.

CORRESPONDENCE AND DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

TARIFF ON ALUMINUM

To the Editor of The Metal Industry:

The following are a few thoughts which I think will be to the interest of the trade.

Aluminum should be on the free list. A number of the leading automobile manufacturers have appointed a committee to work out a plan to bring about this condition, that aluminum be free from tariff.

It is a well known fact that the manufacture of aluminum in the United States is controlled by a monopoly, which is now asking eleven cents a pound tariff on aluminum ingots. They have practically no competition, will be the sole beneficiary of such a tariff and the thousands of brass and aluminum foundries throughout the United States will suffer the loss in business.

If the eleven cent tariff is permitted it will eventually drive every small brass and aluminum foundry in the country out of business, trying to make aluminum castings at 30 cents a pound for ingot. It will make the general use of the aluminum castings prohibitive in the many fields of manufacture for which it is so well adapted. It can be easily seen it will compel its casting customers to resort to other metals.

The world supply of aluminum today is obtained from bauxite, a pure oxide of aluminum. Deposits of it are limited in quantity and all of those known to exist in this country are controlled by a few concerns. Among these is the one that up to the present time has held a practical monopoly or aluminum in the United States. It is my opinion that this country would obtain much more benefit for everyone concerned by creating some competition on the sale of aluminum. So it behooves every brass and aluminum foundry owner, also foremen and molders to register their objections to any increase in the tariff rate on aluminum ingots.

Write or telegraph your Representative to oppose any duty whatsoever on aluminum ingots. Think what business there would be for the brass and aluminum foundries if aluminum was cheap enough to compete with other metals as aluminum is

stronger than cast iron, and has only one-third its specific gravity.

So Mr. Foundryman, if you want to see your foundry business continued, get busy and see that aluminum ingot is put on the free list, and have some competition in aluminum ingots as well as in aluminum castings.

Business without competition is not a healthy condition for the country. Do not delay to make your protest in this matter. Don't wait until after you are paying 30 cents per pound for aluminum ingots and have a losing business on your hands.

W. J. REARDON.

DETROIT, MICH., MAY 4, 1921.

To the Editor of THE METAL INDUSTRY:

Cost of aluminum in the U. S. is increased in about the same proportion as the duty is increased. In 1914 when the tariff was fixed at 2 cents, aluminum sold at an average price of 19 cents per pound. With a duty of 7 cents, however, during the greater part of 1913, the average cost of aluminum was 23 cents per pound representing a difference in increased price of 4 cents or nearly the amount of difference between the duties prevailing in 1914 and 1913 respectively.

According to the following tabulation taken from page 447 of Metal Statistics for 1921*, this tendency of increasing prices was also in evidence from 1905 to 1908 when a duty of 8 cents per pound applied to crude aluminum.

		Prices Per Pound					Prices Per Pound		
Year	Tariff	High	Low	Average	Year	Tariff	High	Low	Average
1905	8c	35c	33c	34c	1910	7c	24c	22c	23c
1906	8	38	35	36.5	1911	7	23	19	21
1907	8	50	36	48	1912	7	27	19	23
1908	8	34	22	28	1913	7	27	19	23
1909	7	24	22	23	1914	2	21	17	19

Average price from 1905-1908 under 8c tariff 36.6c
Average price from 1909-1913 under 7c tariff 22.6c
Average price from 1914 under 2c tariff 19c

This close relation between increased aluminum prices and tariff shows that with high duties, there have been high prices for aluminum.

This tendency of having the aluminum prices conform to the duties prevailing, is evidence that the sales of that metal in this country are well controlled and that any future increase in duty may be expected immediately to be followed by a corresponding increase in aluminum prices. This would be all the more readily accomplished because, within the United States there is but one large company that controls the aluminum market. To shut off or diminish competition, therefore, from abroad, would limit consumers of aluminum to practically one source of supply and oblige them to pay correspondingly high prices.

The automobile industry, being the largest consumer of aluminum, wishes to register its emphatic protest against tariff increases that will make such an adverse condition possible.

NATIONAL AUTOMOBILE CHAMBER OF COMMERCE.
MAY 23, 1921. Attested, G. F. BAUER, DIRECTOR.

*Because of the authenticity of information, the data contained in Metal Statistics served as a basis of procedure for either party in the suit of the U. S. Government against the U. S. Steel Corporation.

MORE LOCKWOOD INVESTIGATIONS

Samuel Untermyer in his investigations into manufacturers' associations, for the Lockwood Committee, attacked the Greater New York Association of Jobbers in Heating and Plumbing Supplies. The New York Times commented editorially in its issue of May 6, 1921, in part as follows:

"Mr. Untermyer has furnished a much-fleeced public with some more details about its benefactors. Some one thousand jobbers and manufacturers of plumbing material and fittings, with a total capital of $300,000,000, are combined to control the whole plumbing business of the country except on the Pacific Coast. By means of the price-reporting system they were able to fix prices. When the price-reporting system was given up last Fall, just about the time the Lockwood committee began operations, the local association, concisely called the Greater New York Association of Jobbers in Heating and Plumbing Supplies, began to hold monthly meetings. Mr. Frank H. Hanley, the $11,000-a-year secretary of the Sanitary Potters' Association, the Range Boiler Association, the National Association of Brass Manufacturers, the National Association of Woodwork Manufacturers, artlessly includes among the purposes of these meetings 'the social features' of these interlocked plumbers' clubs.

"By means of a 'Standardization Bureau' they have driven out all cheap plumbing stuff. Everything cheap is 'insanitary.' The builder isn't allowed to buy, for instance, anything but the heaviest and most costly kind of pipes and earthenware for bathroom use. These associated philanthropists control the market in boilers, gas ranges, all sorts of pipe, enamelware, earthenware, porcelain, brass and copper fittings. The whole continent of plumbing, except on the Pacific Coast, is theirs. No jobbing plumber not in the fraternity of these lords of housing can buy from the manufacturers save by difficult and round-about ways that soemtimes have to be 'sweetened' by commissions."

Concerning this editorial W. M. Webster, Commissioner of the National Association of Brass Manufacturers, writes as follows:

To the Editor of THE METAL INDUSTRY:

I am just in receipt of yours of the 11th enclosing an editorial from the New York Times outlining the Untermyer-Hanley fiasco, and in reply would say that this is a grossly garbled lot of truck, so much so that it almost raises the question as to whether what we read in papers and press is worth wasting our time on.

You may be advised that Mr. Hanley has no connection with this office or the National Association of Brass Manufacturers, nor are we involved in any way, shape, or manner in this controversy, and have absolutely nothing to fear from any source, as that is the method and manner upon which we conduct the policy of this office.

I see in this article it refers also to the National Association of Sanitary Woodwork Manufacturers, which is also handled from this office, and what I have said here pertaining to the National Brass applies with equal force and effect to the National Woodworkers' Association.

W. M. WEBSTER,
CHICAGO, ILL., May 14, 1921. Commissioner.

WORTHLESS CEMENT

To the Editor of THE METAL INDUSTRY:

We write to advise you of the activities of Mr. F. A. Harris who has been selling a formula which we believe to be worthless and which we are sure a good many other concerns have found to be worthless. The formula is

Casein Com.	¼ lb.
Silicate Potassium N.	6 lb.
Oxide of Zinc	¼ lb.
Glucose	¼ lb.
Dextrine White	¼ lb.
Oil Myrbane	1/16 lb.
Rain or Condensed Water	½ gal.

The above formula is said by Mr. Harris to make an excellent cement for holding blades of knives in hollow handles, and when the formula is modified slightly the cement is so plastic that it can be used as a glue for covering wheels dressed with emery, etc. The material is claimed to be fire proof and to prove this Mr. Harris shows matches which are said to be dipped in the material so that they will not burn beyond half way; also he shows paper which will resist fire. Innumerable other uses are mentioned by Mr. Harris, all of them quite too good to be true, now that we investigate.

Mr. Harris gave the address of 120 West 6th street, St. Louis, Missouri. He offers the formula for your exclusive use within your own city for $50.00 or for $25.00 without the exclusive privilege.

We advise you of this case in the hope that you will give the matter publicity in your publication and that you will forward this information to any other source which reaches the field Mr. Harris might approach. We believe Harris should be restrained by more positive methods, but it would be difficult, technical and costly to prove our contentions in court. We feel convinced that he is making a dishonest living by this means.

Thanking you for any publicity given this matter, we remain

REED & BARTON,
by H. N. BALDWIN.

TAUNTON, MASS., MAY 11, 1921.

GOVERNMENT PUBLICATIONS

Mineral Production of Spain, 1918-1919.—U. S. Geological Survey, Washington, D. C.

Principal Features of the Domestic Manganese Industry for the Year 1920.—Outlined by H. A. C. Jenison, U. S. Geological Survey, Washington, D. C.

Mineral Production of Sweden, 1918 and 1919.—U. S. Geological Survey, Washington, D. C.

World's Production of Zinc Ore and Estimated Zinc Content in metric Tons.—U. S. Geological Survey, Washington, D. C.

Mine Production of Zinc in the United States, 1918-1920.—U. S. Geological Survey, Washington, D. C.

World's Production of Zinc, 1913-1920.—U. S. Geological Survey, Washington, D. C.

World's Production of Lead, 1913-1920.—U. S. Geological Survey, Washington, D. C.

Cadmium in 1920.—By C. E. Siebenthal and A. Stoll. U. S. Geological Survey, Washington, D. C.

Zinc in 1918.—By C. E. Siebenthal. U. S. Geological Survey, Washington, D. C.

Asbestos in 1919.—By J. S. Diller, U. S. Geological Survey, Washington, D. C.

Technical and Scientific Literature

STAGES IN THE RE-CRYSTALLIZATION OF ALUMINUM SHEET ON HEATING, WITH A NOTE ON THE BIRTH OF CRYSTALS IN STRAINED METALS AND ALLOYS*

By Professor H. C. H. CARPENTER, M.A., Ph.D., A.R.S.M., F.R.S., Past-President, and CONSTANCE F. ELAM, Member (London).

The paper is closely connected with that presented by the authors at the previous Meeting of the Institute on "Crystal Growth and Recrystallization in Metals." The investigation has been designed to throw as much light as possible on the structural changes which accompany the gradual softening of cold rolled aluminum sheet on heating. The sheet was prepared from a casting measuring 21" by 9" by 4¾", which was rolled by various steps down to ⅛". This sheet represents a reduction in thickness of 97%. Statements have been made by two previous investigators, namely, Brislee and Anderson, that aluminum loses its crystalline structure on working and becomes completely amorphous. The present authors show that this statement is incorrect: even in the cold rolled sheet the crystals, though very much flattened and to some extent driven into one another, retain their identity.

The authors find that there are three distinct types of structure produced on heating this sheet.

(1) Type 1 is characteristic of metal heated for long periods at 200°C. and for short periods at 250° and 300°C. It is the first visible structural change and is characterized by a general tarnishing of the surface, a granular structure and a blurring of the original boundaries of the flattened crystals.

(2) Type 2 is the birth of new crystals in the old boundaries. These always appear white in contrast with the tarnished unreoriented crystals. Characteristic of this type is the presence of new and old crystals in the same specimen: examples of this are the early stages of re-crystallization at 250° and 300°C.

(3) Type 3 is the structure finally obtained after heating to structural equilibrium at a given temperature. Of this there are two distinct forms depending on the temperature at which they are produced:

(a) The crystals are very much elongated in the original direction of rolling and there is always a tendency for some of them to darken on etching Prolonged heating at 250° and 300°C produces typical examples of this sub-class.

(b) The crystals approximate more nearly to the equi-axed condition the higher the temperature, though even at the highest temperature they still show a slight elongation in the direction of rolling. There is little or no tarnishing of the crystals. Examples are specimens heated at 450° to 600°C.

Specimens heated at 350° to 400°C furnish examples in each of the sub-classes (a) and (b). In the early stages they resemble (a) and in the final stage (b).

In a Note appended to the above paper on "The Birth of Crystals in Strained Metals and Alloys" the authors furnish further examples of the fact that re-crystallization is always observed to begin in the boundaries of the distorted crystals, using the term "boundaries" in the broad sense to include twin boundaries. The only instances in which the new crystals were formed in the interiors of the old crystals were those in which they originated at a segregated impurity, and here also there is a boundary, although of a different kind.

*Presented before British Institute of Metals, London, March 9, 1921.

THE CONSTITUTION OF THE ALLOYS OF COPPER WITH TIN, PARTS III AND IV*

By J. L. HAUGHTON, D.Sc., F. Inst. P., Member (Teddington),

This paper describes the constitution of the copper-tin alloys containing from 40 to 100% of tin below a temperature of 400°C. The constitution was investigated by means of thermal curves, electrical conductivity measurements and microscopic examination of annealed and quenched specimens. It has been shown that there is a polymorphic transformation in one of the constituents at a temperature of about 180°C, and in a few of the alloys a further transformation occurs at 210°C, which so far cannot be explained. The limits of solubility of tin in copper have also been investigated and it is found that not more than 0.2% of copper dissolves in solid tin. An appendix is added to the paper describing the work of certain other investigators on the copper-tin system.

PYROMETRIC PRACTICE

Bureau of Standards, Technologic Paper No. 170, "Pyrometric Practice."

A complete treatise of the practical phases and applications of pyrometry is presented. All general methods of measurement, instruments, use and standardization of pyrometric apparatus are discussed. The paper is illustrated with cuts of modern American instruments. Many tables of data are included and the treatise contains an index for ready reference.

BLACK NICKEL PLATING SOLUTIONS

By G. B. HOGABOOM, T. F. SLATTERY and L. B. HAM.

Bureau of Standards, Technological Paper No. 190.

To produce the so-called government bronze finish on military hardware, "black nickel" plating was frequently applied. Investigation showed that for this purpose very complicated solutions were frequently employed and at times very great difficulty was encountered in producing uniform results. This paper describes the results of a few experiments upon such solutions and contains recommendations regarding the composition and conditions of operation which will yield satisfactory deposits.

THERMAL EXPANSION OF COPPER AND ITS IMPORTANT INDUSTRIAL ALLOYS

By PETER HIDNERT.

Bureau of Standards Scientific Paper No. 410.

Data on the thermal expansion of 128 samples of copper alloys of various composition (56 to 100 per cent. copper), heat treatments, mechanical treatments, etc., are presented.

Definite mathematical relations were found to exist between the instantaneous coefficients of expansion and the copper content of most of the alloys investigated. In general, the coefficient of expansion increases with a decrease in the copper content. The addition of lead or tin has a decided effect on the coefficient; the former element generally decreases, and the latter increases the coefficient.

The effects of cold working were also studied. For example, the coefficients of cold rolling copper zinc alloys containing from about 62 to 90 per cent. copper, are greater than the coefficients of corresponding castings.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ALLOYING

Q.—As subscribers to your magazine we would appreciate it very much if you would advise us of your opinion as to the best method of making up an alloy consisting of 90 per cent. zinc, 5 per cent. copper and 5 per cent. aluminum. Will you kindly state whether a hardening mixture should be used, and if so, what proportions of the same should be used?

A.—This alloy of 90 per cent. zinc, 5 per cent. copper, 5 per cent. aluminum is somewhat similar to Sampson Bearing Metal and is made as follows: A rich alloy is made of 50 per cent. copper and 50 per cent. aluminum. Melt the copper and draw from furnace. Pour the molten copper on the aluminum, using a large enough crucible or iron pot so that all the pig aluminum will be in the crucible before pouring the molten copper on the aluminum. Stir the mixture well, pour into ingots and use as follows. Melt 90 parts of zinc and add 10 parts of rich alloy. Keep the metal covered with blocks of wood charcoal or sawdust; pour at dull red heat.—W. J. R. Problem 2,952.

ALUMINUM CASTING

Q.—I am asked to make some castings of an alumimum alloy to be used in a check valve in a pump for water under some pressure as a disk. This casting has to be water-tight, free from porosity and not to show wear very easily after grinding and setting it perfectly.

I have made some other castings for the same party of magnalium (the formula you sent me). I wish you would inform me if this will do or some other formula.

I have been asked to make gold dental plates and to comply with this demand have constructed a casting machine which is satisfactory to me and I am now experimenting with an investment material (plaster paris with some fireproofing material) which I intend to make the molds of.

Can aluminum be successfully plated with gold?

A.—I should recommend a mixture of 96% aluminum, 2% copper, 2% of magnesium. This is a good alloy for aluminum castings subjected to pressure and makes a dense and strong casting, easy to machine, and is suitable for a great variety of work.

Plaster molds are made successfuly by a number of concerns and are taking the place of die-castings in a great many instances as it is possible to cast within .004" and gives a fine surface finish. A number of mixtures are used such as lime and plaster paris, plaster paris one part, brick dust two parts; a small amount of asbestos is added. There is a patented mixture No. 1,281,679 plaster paris 40%, asbestos fiber 30%, brick dust 30%. It is very essential that this should be thoroughly dry before using. If not the metal will not lie on it. Considerable knowledge is required for the handling and drying of the mold to make successful castings.—W. J. R. Problem 2,953.

ALUMINUM SHEET TEMPERS

Q.—Will you kindly give me the following information in regard to rolling aluminum sheet:

The sheet is to be 26 gauge, one-quarter hard. Would like to know at what temperature and for how long the slabs are to be annealed; also what test is used to determine the hardness of aluminum sheet?

A.—Tempers of aluminum sheet are designated as soft, one number hard, two numbers hard, three numbers hard, etc. These numbers refer to the Brown and Sharpe Gauge. Tempers are also designated as quarter-hard, one-half hard, three-quarter hard and hard. A sheet to finish No. 26 B. & S. gauge, one-quarter hard would be annealed at 19½ or .034". One-half hard would be annealed at No. 13 B. & S. gauge or .072". Three-quarter hard would be annealed at 6½ B. & S. gauge or .144".

The annealing is done at about 350 deg. C. If a pyrometer is not handy the sheets may be placed in the annealing furnace and allowed to become just hot enough so that when a pine stick is drawn across their surface it will leave a dark streak behind it. If too hot the stick will blaze and if not hot enough the stick will not leave a mark when drawn across the surface of the sheets. The usual means of hardness testing is the Shore Scleroscope.—P. M. T. Problem 2,954.

BLACK NICKEL

Q.—I have a sulphocyanide, black nickel solution which is causing me a little trouble. It was not getting a black deposit but a grayish one. I was using one volt, with an addition sulphate of zinc, sulphocyanide and some water ammonia 26. Now after work has been in the solution about half an hour a green scum forms on top of solution.

A.—We believe that your black nickel solution is too alkaline, or you have added too much zinc to the solution.

When once a solution has been prepared, it very seldom requires an addition of zinc. The addition of sodium sulphocyanide and occasionally a very little double nickel salts is all that is required. The green scum, that forms upon the top of the solution, denotes alkalinity. Neutral solutions, are, as a rule, clear. Add a small amount of muriatic acid to the solution; start with 1/32 ounces per gallon; be very careful not to add an excess. Afterwards add a little more sodium sulphocyanide, ½ to 1 ounce per gallon.—C. H. P. Problem 2,955.

BLACK NICKEL

Q.—Is it possible to get a heavy deposit on articles from a black nickel solution the same as you can from a white nickel or copper solution? I have a small sulphocyanide black nickel solution but cannot get a heavy deposit on to the work. I leave the work in the solution after nickel plating for over an hour at 1 volt, but after I have dried the work it is very easy to scratch the black nickel off again after it has been lacquered.

A.—It is not possible to deposit black nickel as heavily as copper or white nickel. Black nickel is a sulphide of nickel and its deposition has a limit.

It is possible that your black nickel solution has become too radically alkaline. You should not be able to scratch the deposit off as easily as you state. We would suggest that a very small amount of muriatic acid be added to the solution (1/32 ounce per gallon). Repeat if necessary to improve the deposit. Make a test with two or three gallons of solution, before adding the acid to the entire solution.

Lacquers for black nickeled surfaces should be similar to brush lacquers, that are used upon brush brass, oxidized copper, etc. Such lacquers contain a higher percentage of gums mixed with the cellulose base, and so adhere better than a transparent lacquer prepared exclusively from cellulose. The latter type of lacquer is not suitable for nickel or black nickel surfaces.

Mr. Joseph Haas, Jr., gave a very interesting formula for a new type of black nickel solution in his article on black nickel solutions, published in the February issue of THE METAL INDUSTRY. If you would give this solution a trial it is possible that much heavier deposits may be obtained—C. H. P. Problem 2,956.

BRASS VALVES

Q.—We have been making some angle and globe valves from ¼" up to 2" and our customer specifies 86 to 87% copper, 6% tin minimum, 2½% lead maximum and the balance zinc. We have used all new metals and melted same in a No. 70 crucible using gas for fuel. When the castings are shaken out and cleaned up the outer appearance is very good, however after they machine them and put them under a 250 pound pressure they show leaks. Kindly inform us if the analysis that we are using is correct and what would be the cause of this trouble, also any information that you can give us. We have analyzed several batches of defective castings and can find no trace of aluminum or any other foreign metal.

A.—The mixture you are using is entirely satisfactory and is considered one of the best mixtures in the valve line. In fact, it is a little too good unless you are getting the price to justify it.

In nine cases out of ten the difficulty that you are experiencing, is caused by the oxidation of the metal during melting. The mixture becomes porous because the metal is allowed to absorb oxygen and other gases, while it is being melted.

The remedy is better melting practice. Use plenty of fine charcoal as a cover and a handful of common salt. Very often it is difficult, in a gas fired furnace, to hold the charcoal on the metal in the crucible, because of the blast necessary for combustion. In that case, the use of green glass is advisable.

We suggest the following method of melting. When the crucible is charged, place a ring on top of it, that is made from an old crucible that has been discarded. In this way the copper can be charged all at one time, and sufficient charcoal added to make a cover about 2 inches thick. Then add a handful of salt. Melt the copper quickly. Be sure to get the copper good and hot before adding the mixture. Bring the temperature up to at least 2,100 Fahr. Add the lead, then add the tin and stir, then add the zinc. Allow the metal to stand a few minutes before pouring.

Pour the castings hot, not less than 1,900 deg. Fahr. Dull, sluggish metal will cause porous castings.

I presume your molding practice is correct and that you have a four inch cope, so as to give head pressure to the metal when pouring.

It may be that you cannot look after the metal all the time as it is essential to do to melt the metal with least oxidation, and you may be required to use a deoxidizer as a medicine. We suggest using 3 ozs. of 15% phosphor copper per 100 lbs., to be added just before pouring.—W. J. R. Problem 2,957.

CASTING WAX

Q.—I request information as to the name and composition (if possible) of casting wax in general foundry use. I am engaged in the casting of art bronzes, and need a wax which will furnish me with a good smooth surface, which will not soften from handling, and which has a negligible shrinkage.

A.—Pure white bees wax should be used for wax molds. This wax is hard in itself, and in order to be worked should be softened with turpentine enough to suit. Also a little rosin should be used. The amount can be determined by your judgment and experience. For more common work, yellow bees, being cheaper, can be substituted for the white.

Virgin bees wax when new shrinks more than when it has been remelted several times. Venetian turpentine, added to it in a small quantity, say one ounce to a pound of wax, will keep it from shrinking.

Any good foundry supply house such as E. J. Woodison & Company, Detroit, Mich., can furnish you with this wax. This concern maintains a branch in Seattle.

If you desire to color your wax, you can mix it with English vermillion or chrome yellow, light or dark, without fear of any trace being left in the mold after the wax is burned out, and a very nice color can be obtained.—W. J. R. Problem 2,958.

ROLLING MILL BRASSES

Q. What is the composition of a good hot and cold rolling mill bearing that will not break or cut the roll necks?

A.—Rolling mill brasses are made of approximately 90 per cent. copper and 10 per cent. tin. This mixture with additions of lead in varying amounts will make a satisfactory brass for rolling mill work. A mixture of 85 per cent. copper, 8 per cent. tin and 7 per cent. lead makes a good all around bearing mixture.

A great many times the cause of mill brasses breaking and cutting the roll necks is due to improper lubrication. If the brass becomes dry it will "burn" causing an extremely hard spot to form which will cut the roll neck. Numerous spots of this kind will cause grooves and ridges to form in the roll neck. Emery or other gritty substances in the lubricant will also cause the roll neck to cut. The care of the bearings is as important as the composition of the brasses and an operator who allows his to become dry and cut does not deserve much sympathy. If a lubricant is being used which is not suitable for the work in hand, do not blame the operator.—P. M. T. Promblem 2,959.

SOLDERS

Q.—What is a good solder for zinc? Also what solder will melt between 200 deg. and 300 deg. F.?

A.—A good solder for zinc is a good quality half and half tin lead solder using concentrated zinc fluoride as a flux. It is not necessary to include cadmium in the mixture.

These mixtures melt at about 203 degrees:

TIN	BISMUTH	CADMIUM
2	3	1
3	5	1
1	2	1

BISMUTH	LEAD	TIN	MELTING POINT
8	5	3	212
8	8	4	236
8	8	8	254
8	10	8	266
8	12	8	270
8	16	14	289

—A. B. Problem 2,960.

STRIPPING FIRE COAT

Q.—Please give a method to remove the fire (without injury to articles) from 9-15-18 carat gold and sterling silver. What I mean by fire is the discoloration on the work as it comes from the makers after brazing and silver soldering, etc.

I am told that a strong solution of cyanide will remove it, but have not had much success.

A.—For removing the green or fire coat from karat alloys, the following formula gives good results and may also be used for removing fire coat from silver:

Water	1 gallon
Sodium Cyanide	5 ozs.
Yellow Prussiate of Soda	4 ozs.

Arrange the solution as an electric-stripping solution, the articles becoming the anodes. Use sheet carbon as the cathodes. It is best to use three poles, one for the work to be stripped in the centre. Connect the two outer poles with the positive current; negative for the carbon cathodes.

Use the solution warm with a good strong current. Move the articles to and fro while stripping.

For removing the green or fire coat from gold, see article by Charles H. Proctor in the November 1910 issues of THE METAL INDUSTRY, page 468. The fire coat can also be removed from silver by immersing in a hot solution, for a few moments, of the following:

Nitric acid 38 degrees	1 to 2 parts
Water	2 " 3 "

A cold electric strip may also be used for silver by using a strong solution of sodium cyanide. If heavy sheet zinc is used as the cathodes, the silver will not adhere and be precipitated at the bottom of the tank as metallic silver.—C. H. P. Problem 2,961.

TUMBLING

Q.—We have a large quantity of small pieces made from 22-gauge hot rolled sheet to clean for plating. We now pickle, then tumble in cut leather to polish, but it takes sixteen to twenty hours to polish bright enough for a good finish. The barrel is 48" in diameter, running at 25 revolutions per minute. We would appreciate it if you could suggest a quicker method of cleaning. Would it help matters to change the speed of the barrel?

A.—To facilitate the tumbling of the steel parts, which, as you mention, requires sixteen to twenty hours, the parts being tumbled in cut leather to give a bright finish for plating, we would suggest that you supplement your pickling methods by tumbling the steel parts in a solution made up as follows:

Water	1 gallon
Soda Ash 58%	2 ozs.
Sodium Cyanide	½ "

Add sufficient cinders, about the size of a hazel nut, as an abrasive. If you use a steam boiler you should have plenty of cinders. Two hours tumbling in the cinder solution, followed by four to five hours or less in the leather, should give you the desired results, and will reduce your tumbling time two thirds.—C. H. P. Problem 2,962.

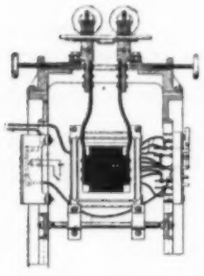
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,371,769. March 15, 1921. **Apparatus for Winding Metal Strips.** August Sundh, of Hastings-on-Hudson, N. Y., assignor to Sundh Engineering and Machine Company, of Philadelphia, Pa., a corporation of Pennsylvania.

This invention relates to a method and apparatus for preparing metal strips for manufacture wherein a more perfect product and higher production at minimum expense may be obtained than has been possible with apparatus of this character, as heretofore constructed, and wherein the strips, after being treated, are coiled up bright, clean and dry, and free from buckles.

1,372,634. March 22, 1921. **Method of and Apparatus for Brazing.** George A. Thornton, of Port Washington, New York, assignor to Thornton Transformer Company, Inc., of New York, a corporation of New York, N. Y.

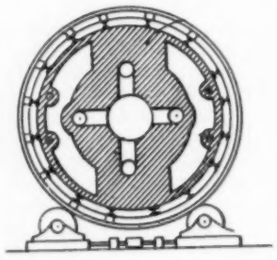


This invention relates to methods and apparatus for brazing and has for its object the providing of means for brazing articles together which shall overcome the danger of overheating and other disadvantages of the methods heretofore used for this purpose.

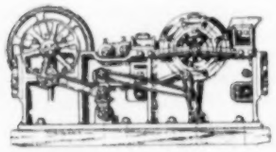
A method has been devised by which the heating may be accurately controlled by the operator. According to my method the articles to be brazed are heated by passing an electric current through them or through a resistance adjacent to them.

1,372,406. March 22, 1921. **Rotary-Furnace.** Felix Derneden, of Charleroi, Belgium.

The present invention relates to the metallurgical industry in general, and refers more particularly to a new method of constructing revolving furnaces. By "revolving furnace" is generally understood apparatus rotating about an axis either horizontal or more or less inclined to the horizon and coinciding with the axis of the apparatus itself, such apparatus being utilized in industry for carrying out various operations such as drying, roasting or calcining and various chemical reactions, etc.



1,372,160. March 22, 1921. **Briquetting-Press.** William P. Michaelsen, of Minneapolis, Minn., assignor of one-half to Eileen Michaelsen Klebba, of Minneapolis, Minn.

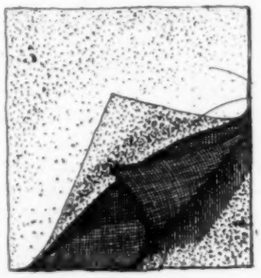


This invention relates to presses for forming loose, granular, fibrous or pulverulent materials into briquets, particularly materials such as peat, lignite, coal-dust, sawdust, and similar substances suitable for fuel. It is the object of this invention to provide a plurality of molds rotatably mounted and arranged to pass successively positions at which the loose material is fed thereinto, then to positions at which the charge of material is compressed into a briquet, then to positions at which the briquet is ejected from the mold, and finally returning to the feed position, whereby the formation of the briquets may be continued indefinitely and automatically, without attention other than to continue the supply of material to the machine.

1,372,405. March 22, 1921. **Metal-Coating Tester.** Allerton S. Cushman, of Washington, D. C.

By this method it is not necessary to cut specimens of accurate dimension or length from the coated metal under investigation, and thereafter go to the expense of time and money in accurately measuring or machining the specimen to a specified length or area. The object of this invention is to provide a glass apparatus as illustrated, which can be placed upon the surface of coated sheet metal at any desired spot, and by letting in the acid onto the spot, strip the zinc coating, collect the hydrogen gas evolved by the reaction in a tube so suitably graduated that the volume of hydrogen measured will accurately measure the weight of protective coating in ounces per square foot or in any other desired system of prescribing the weight per unit surface.

1,373,273. March 29, 1921. **Electrode for Electrolytic Recovery of Metals from Solutions.** Urlyn Clifton Tainton, Martinez, Calif.

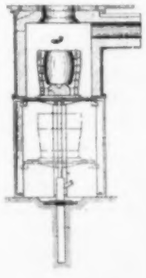


The present invention relates to apparatus for electrolytically precipitating gold and other metals from their solutions, more particularly solutions derived from the cyanid process; said apparatus being of the kind in which the pregnant solution is caused to pass through a permeable cathode, the interstices of which are very small.

1,372,805. March 29, 1921. **Art of Welding.** Joseph W. Fay, of Milwaukee, Wis., assignor of one-half to Harry G. Nye.

In welding metal parts in accordance with the present invention, the edges to be welded together are spaced apart at all points, the space between them being usually of substantial width as compared with the thickness of the parts at their edges and weld metal is supplied between them in fused state while a welding heat is supplied. Welding of parts of substantial thickness may be strongly and easily effected by the present method, particularly in the case where heavy gage material is employed.

1,372,676. March 29, 1921. **Crucible-Furnace.** Jean Hubert Louis De Bats, of Zelienople, Pa., assignor by mesne assignments, to Lava Crucible Company, of Pittsburgh, of Pittsburgh, Pa., a corporation of Pennsylvania.



This invention relates to so-called "crucible furnaces" in which metals are melted, refined or otherwise treated in pots or crucibles placed within the furnace. The object of the invention is to provide a furnace of this kind which will conserve and extend the life of the crucible or pot; prevent oxidation and contamination of the metals being melted and treated, by the gases produced by the combustion of the fuel in the furnace.

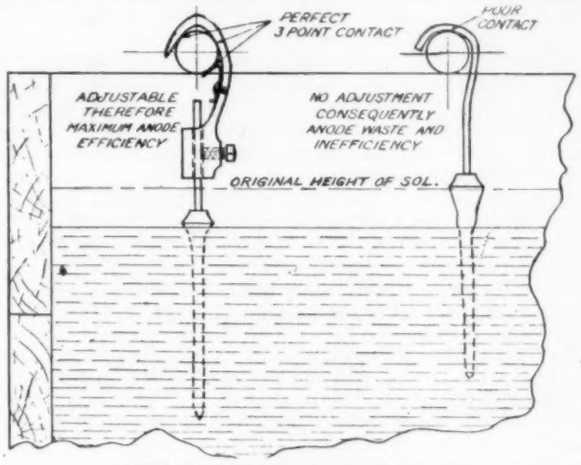
EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

NEW CONTACT HOOK

An adjustable hook made of cast brass designed to meet the needs of more efficient electrical contact principally for anodes used in electroplating and electrotyping, also as support for racks on cathode rods.

It is claimed that by the V shape or concave form of suspending hook, by adjustment of the slide, spring or clip, a perfect 3 point contact on various size rods supporting the



SERVIS ANODE HOOK IN PLACE

anodes is obtained. It is limited only to the size of the mouth of the hook which is made to fit any size rod generally used in electroplating plants.

The hole through the base of the hook permits adjustment of the anode by raising or lowering the anode stem (which is firmly held in place by set screws), to the surface level of the solution, allowing a full anode surface efficiency and reducing waste.

This hook is made by O. E. Servis, 5305 Warner avenue, Chicago, Ill.

NEW TUMBLING BARRELS

The Henderson Brothers Company, Waterbury, Conn., will soon put on the market a new tumbling barrel, especially adapted for work that tends to tangle and rust. The principle on which the machine works is that of one complete oscillation for every seven revolutions. It was built originally for fish-hooks.

They are also marketing a "Bench Machine" which is one of their large machines reduced in size. The advantage claimed is that it can be started and stopped without the use of tight and loose pulleys. It is friction driven and the necessity of removing the barrel to empty is done away with.

A NEW TANK FILTER

The Belke process of treating electrolitic solutions consists of purifying, aerating and circulating the electrolyte. It produces three distinct operations combined.

PURIFICATION

Results unequalled in practice have been obtained in the laboratories where they used a perfectly clear and pure solution and kept it under a glass case so no foreign matter could settle in it. Such a condition is impossible in practice. The tanks must be kept open when in use so that the work may be readily handled. Thus the dirt from buffing, the metal dust from grinding, and flying particles find a natural resting place in it. The object to be plated also carries with it more or less foreign matter, also the chemical action taking place during plating causes a large precipitate. This dirt is very detrimental to the quality of the deposit as it is disturbed very easily even when the work is handled carefully, as it roughens the deposit also causes blemishes, discoloration and pin holes which are the bane of all electroplaters. In fact a considerable quantity of the work must be "stripped" and done over again. Dirt and sediment are non-conductors and act as a direct resistance to the current, thus decreasing the plating capacity.

It is claimed that by the process of continuous filtration, the solution is filtered several times an hour, the dirt being removed; no over-time is needed for tank cleaning, and the solution is ready and workable 24 hours of the day, and 365 days of the year. The contention is that a

SOLUTION WILL NOT GO STALE WHEN CONTINUOUSLY FILTERED

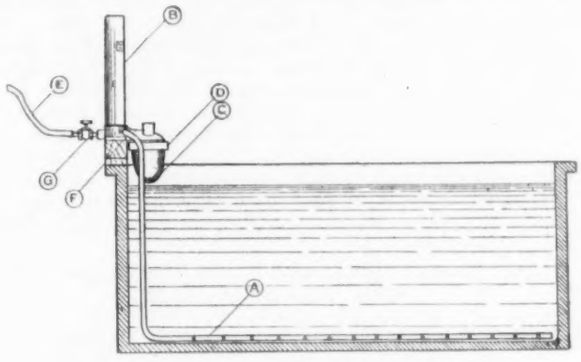
and that this eliminates the mixing of new solution at variable periods. All that is necessary is sufficient additional salts to keep the hydrometer reading up.

AERATION

It is stated that by actual tests the manufacturers have determined that the increase in the deposit in a solution that is thoroughly aerated and one that is not is just 24.1%. In this process the entire solution in the tank is mingled and flushed with air several times an hour thereby thoroughly mixing the air with it.

CIRCULATION

Circulation is a great quickener of electro-chemical action. By this process they move the solution gently and continuously. This causes it to be of uniform density throughout. It also tends to drive off the hydrogen bubbles which collect on the work, keeping the solution away from the shell. With no contact there is no plating, until enough hydrogen collects to allow the bubbles to rise to the surface. This one trouble caused the installation of air agitation in



BELKE TANK FILTER IN PLACE

electrotype work. Air agitation roughens work, but by this process the makers claim to move the hydrogen off gently, and keep the deposit glass-like, thus saving in the time of buffing.

The outfit consisting of a pump and filter as shown in the sketch, sets upon the end of the tank and occupies very little space. It does not interfere or displace any cases. It is operated by the air, and requires no extra installation. Very little air is required to operate it, one or two pounds being sufficient.

The outfit consists of three main parts, the suction piping (A), the reservoir and pump (B), and the filter (C). The suction piping (A) is made of pure chemical lead, one inch inside diameter. This piping lies on the bottom of the tank. About 14 ft. length of this pipe is furnished, so that it may be bent back and forth similar to the method of laying agitator piping, or looped around. The pipe, has holes at 5 inch centers its full length through which the solution is drawn. It is pumped up into the reservoir (B). The reservoir is sealed at the top, is three inches in diameter, and twenty inches high. In this reservoir a pressure of 18 to 20 ft. head of liquid is built up. The liquid under such a high pressure is forced down through the filter bag (C). The filter bag

(C) is composed of heavy wool cloth bound with all wool yarn. The bag is clamped in the ring (D). When the bag becomes full of dirt, the ring is unscrewed and the bag washed out. The life time of a bag is about one year.

In order to install the outfit it is claimed that very little work is necessary, and that it should take not more than twenty to thirty minutes. The bars and anodes are moved to one end of the tank. A block (F) is then fastened on the tank edge and the filter set upon it. A small hose is then used to connect it to a plug in the agitator line. The solution is thus taken from the bottom and pumped through the bag continuously from morning to night.

The apparatus is made by W. E. Belke, Fisher Building, Chicago, Ill.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

Confronted with the situation of a scarcity of hotel accommodations and taking into consideration general industrial conditions, the Committee on Convention and Exhibits adopted a resolution recommending to the Board of Directors that the convention be held in New York City, in October or November of this year, without exhibits.

This recommendation was referred by letter to the members of the Board and expressions of opinion requested. On May 28 the Executive Committee of the Board met, and after due consideration of the recommendations of the Committee, and the expressions of opinion by the members of the Board, it was unanimously resolved that the next Convention and Exhibit of the American Foundrymen's Association be held in April or May, 1922, at a place to be selected by the Convention and Exhibits Committee.

NEW YORK BRANCH, A. E. S.

President Sterling presided at the April meetings of the N. Y. Branch of the A. E. S. Mr. P. J. Schening's application for active membership was refered to the Board of Trustees. Messrs. Stretch and B. Cross were elected active members of the N. Y. Branch. The following problems were lengthily discussed: the prevention of Rose Gold darkening upon lacquering; the best method to relieve Jay Gold; the best method of producing Statuary Bronze on large bronze castings; the advantage of potassium cyanide over sodium cyanide in planting solutions.

Beginning June 1, 1921, the yearly dues of both active and associate membership in the New York Branch of the American Electroplaters Society will be ten dollars ($10.00) per year, payable quarterly, semi-annually or annually. All applications for membership presented after September 10, 1920, must be accompanied by an application fee of five dollars ($5.00) and shall pay dues at the new rate.

ST. LOUIS BRANCH, A. E. S.

At the May meeting the "Booster Committee" for Indianapolis was given the right of way, and E. J. Musick, the chairman, received several promises. St. Louis will have at least three papers at the convention and several exhibits.

The following officers were elected for next term: President, C. T. McGinley; vice-president, F. Horath; secretary-treasurer, H. H. Williams; librarian, G. Lamkemeyer; board of managers, F. E. Terrio, E. J. Musick and H. Deubelbeis; delegates to convention, E. J. Musick, H. H. Williams and E. W Heil; alternates, C T. McGinley, J. H. Jordan and W. Flannery.

One application was received and one new member elected.

CHICAGO BRANCH, A. E. S.

On Saturday, May 21, 1921, Chicago Branch A. E. S., guided by our esteemed co-worker, Mr. S. E. Huenerfauth as chairman and assisted by a couple of Supreme Guys, had their party, and it was a grand social success.

The installation of the officers, a feature usually performed without any function in all our branches, got on the nerves of our friend, R. J. Hazucha, who proposed the event and then when president Thornton selected Mr. S. E. Huenerfauth to put it over, this is what happened.

S. E. Huenerfauth wrote, at the cost of considerable time and patience, a beautiful ritual for Installation Ceremony, and selected to assist himself as the Honorary Installing Officer, Past Supreme President, O. E. Servis, and as a mark of honor had on the rostrum during ceremony our esteemed friend and Past Supreme President, Charles H. Proctor.

At the conclusion of ceremonies the chairman furnished us with some nice vaudeville and music, and then spread the dice for "Bunco," which was limited to ten games, as time was short and the prize list was long. Then "Our Proctor" showed some sporting blood, getting second highest prize, the first going to Mr. Gilbertson's daughter.

After distribution of the prizes everybody talked it over and Mr. Huenerfauth set the vaudeville going again. We finished the evening dancing to the music and finally vanished at the charmed hour of twelve.—F. HANLIN, Secretary.

AMERICAN WELDING SOCIETY

The regular monthly meeting of the Metropolitan Section was held in room 2, fifth floor of the Engineering Societies Building, 33 West 39th street, New York, May 17, 1921, 8.00 P. M.

The program consisted of "Electric Welding of Oil Storage Tanks," by William Schenstrom, Electric Welding Co. of America; "Welding of Locomotive Cylinders with Tobin Bronze," by Joseph T. Paight, General Oxweld Inspector, N. Y., N. H. & H. R. R.; "Welding of Oil Engine Cylinders," by A. F. Keogh, Sound Welding Company.

FARADAY SOCIETY

The ordinary meeting of the Society was held in London on March 22, 1921, in the rooms of the Chemical Society, London.

The president, Prof. Alfred W. Porter, F. R. S., was in the chair and delivered his presidential address on "Some Aspects of the Scientific Work of the Late Lord Rayleigh."

Mr. Field read a paper on "The Electrolytic Recovery of Zinc." Mr. W. E. Hughes, B. A., presented a paper on "The Forms of Electrodeposited Iron and the Effect of Acid Upon its Structure." Part I. "Deposits From the Chloride Ball."

ELECTRIC FURNACE SECTION

The Electric Furnace Association has been absorbed by the American Electrochemical Society, and will be known as the Electric Furnace Section.

SOCIETY FOR TESTING MATERIALS

The Twenty-fourth Annual Meeting of the Society will be held at the New Monterey Hotel, Asbury Park, N. J., beginning with committee meetings on Monday afternoon, June 20, and closing with an evening session on Friday, June 24. The entire meeting will be conducted on Daylight Saving time.

BRASS MANUFACTURERS

The last meeting of the National Association of Brass Manufacturers was held at the Iroquois Hotel, Buffalo, N. Y., on June 2 and 3. Reports will be published in our next issue.

LIGHTING FIXTURE MANUFACTURERS

The National Council Lighting Fixture Manufacturers will hold their meeting at West Baden, Indiana, July 6, 7 and 8, 1921.

All members of the organization are requested to be present as matters of importance to the Lighting Fixture Industry will come before the assembly. Information can be obtained from C. Hofrichter, Secretary, 8410 Lake Ave, Cleveland, O.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

Forest Rutherford, consulting engineer, announces the opening of an office at 120 Broadway, New York. He will conduct investigations on mining and metallurgical propositions, design and construct mills and smelters, and advise upon ore smelting contracts.

G. E. Price, Jr., announces his resignation as purchasing agent for the Davis-Bournonville Company, Jersey City, N. J. He will accept a similar position in the Middle West.

M. T. Gerdes succeeds the late Arthur E. Hauck as president of the Hauck Manufacturing Company, Brooklyn, N. Y. He is a graduate of Stevens Institute and was for many years manager of the Treadwell Engineering Company, of Easton, Pa. Mr. Gerdes has a practical knowledge of the manufacture of oil burning torches and appliances.

Fred J. Brunner, secretary and sales manager, **Dr. Weissman,** chemical engineer, and **E. W. Sample,** representative of the Hill and Griffith Company, Cincinnati, Ohio, expect to attend the American Electroplaters' Society Convention at Indianapolis, June 29 to July 2.

Charles Kauffman, 2475 Richmond Road, New Dorp, Staten Island, N. Y., who was formerly connected with White & Brother, in Philadelphia, has accepted a position with the Tottenville Copper Company, Tottenville, S. I., N. Y., as their chief metallurgist and chemist.

Bradley Stoughton, who has been secretary of the Institute of Mining and Metallurgical Engineers since 1913, resigned. Mr. Stoughton believes that the office should not be held too long by any one man. His resignation is to take effect at the convenience of the board. During his term of office the Institute has grown from 3,500 to over 9,000.

DEATHS

KARL G. ROEBLING

Karl G. Roebling, president of the John A. Roebling's Sons Company, of Trenton, N. J., dropped dead while playing golf at Spring Lake, N. J., County Club, on May 29, where he was living at his Summer home, 8 St. Clair avenue. Death is supposedly due to apoplexy. The funeral services will be held at his Trenton home, 211 West State street, the interment being in the Roebling plot at Ewing, N. J. cemetery.

Many interests besides the John A. Roebling's Sons Company claimed a share of his attention. He was vice-president of the Standard Fire Insurance Co., of New Jersey; one of the heads of the MacFarland Foundry & Machine Co., and the Woven Steel Hose Co.; secretary and treasurer of the Trenton Brass & Machine Co.; a director of the Mechanics National bank, Trenton, and of the Trenton Chamber of Commerce, and was one of the most potent factors in the building of the Stacy-Trent, Trenton's new Million dollar hotel.

Mr. Roebling was born in Trenton, July 7, 1873. He was educated in the public schools there taking a college preparatory course at Lawrenceville. He graduated from Princeton university in the class of 1894. He was a member of the Trenton club, Trenton Country, Carteret, and Blooming Grove clubs, besides many other organizations in the larger cities. In addition to his wife and children he is survived by a brother, Ferdinand W. Roebling, Jr., and two sisters, Mrs. F. A. Perrine, and Mrs. William T White, all of Trenton. —C. A. L.

CHARLES E. BURNES

Charles E. Burnes, 72, for many years in charge of the pattern department of the Scovill Manufacturing Company, died at his residence, 160 Bunker Hill avenue, Waterbury, Conn., Friday evening, April 22. Mr. Burnes's health had not been of the best for the past three years, but his serious illness was of eight weeks' duration, during which he was confined to his bed.

Mr. Burnes was born in Nassau, Rensselaer County, New York, April 12, 1849, being the son of Elizur and Biantha Prentiss Burnes. When a small boy he removed to Goshen, Conn., where he went to school. He went to Torrington then to live and was married in Torrington to Miss Mariette L. Whiting of Winchester, and they lived for a time in Torrington, until Mr. Burnes took charge of the pattern-making department of the Seth Thomas Clock Company in Thomaston. Thirty-three years ago they came to Waterbury, Mr. Burnes going to the Scovill Manufacturing Company, where he had charge of the pattern department for thirty years, and where he continued more or less active until last September, when he retired from all work. He was a member of Franklin Lodge, I. O. O. F., and of Columbia Encampment of Thomaston for about forty years, being a charter member of the encampment.

Mr. Burnes leaves his wife; one daughter, Mrs. James Coer of South Britain; one son, Frederick W. Burnes of Waterbury; and three grandchildren, J. Edward Coe[illegible]; Milton E. Coer, and Charles L. Burnes.

GEORGE LEE

George Lee, 51, for a number of years a foreman for the Scovill Manufacturing Company, died Thursday evening, April 7, in a sanitarium in Hartford, where he had gone some time ago in hope of recovering his broken down health. Mr. Lee had been in poor health for a long time and the death of his wife about a year ago resulted in his complete breakdown.

Mr. Lee was a member of the Scoville Foremen's Association. He leaves two sons, Harold A. Lee of Waterbury and George P. Lee of Greenville, S. C.

JUSTUS STAHN

Justus Stahn, a prominent jeweler and founder of the Astronomical Society of Baltimore, died on May 16 at his home, 506 Ensor street, Baltimore (Md.), after an illness of several years. He was 57 years old and one of the old time jewelers of the South.

He is survived by a widow, Mrs. Adeline Chamberlain Stahn; two daughters, Mrs. Chester F. Johnson and Mrs. James S. Pates; a son, Justus M., a sister, Miss Louise A. Stahn, and six grandchildren.

WILLIAM GILMORE HOFFMAN, JR.

William Gilmor Hoffman, Jr., died at the Union Protestant Infirmary, Baltimore (Md.), May 21. Mr. Hoffman, who was one of the owners of the Locke Insulator Corporation of South Baltimore, had been in ill health for about a year. Death was caused by the complication of diseases. He is survived by a widow, three sons and one daughter.

CHARLES M. JARVIS

Colonel Charles M. Jarvis of Hartford, Conn., former president of the American Hardware Corporation, died in Hartford. He was 65 years old, and was once president of the Berlin Iron Bridge Company and financial secretary of the Federal Adding Machine Company.

VICTOR E. TRESISE

The Ohio Pattern Works and Foundry Company, Cincinnati, Ohio, announce with deep sorrow the death of their vice-president and secretary Mr. Victor E. Tresise, on Tuesday, May 3, 1921.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

JUNE 1, 1921.

On May 11 the **Scovill Manufacturing Company** issued a notice of a cut in salaries and rates of pay, the cut to be effective on May 20, and to continue until further notice. The reduction affects practically every employee of the company. The notice reads:

"Effective May 20, 1921, and until further notice the following reductions in salaries and rates of pay are ordered:

"1. Hourly and day rates of employees are reduced by twenty per cent of present ratings; provided, however, that the minimum hourly rate for adult males shall be thirty-five cents.

"2. The addition of twenty-two (22) per cent of basic piece rates which has been in effect from June 20, 1919, is suspended.

"3. Salaries of all officials and of employees paid by the year, month or week, are reduced by 10 per cent of present rates. This reduction is applied in addition to the reduction of 10 per cent effective November 4, 1920."

The Scovill Company had a complete exhibition of seamless brass tubing at the Marine Exposition which was recently held in Philadelphia. According to a semi-official report of the exposition, Scovill products, and especally Scovill tubing, were very favorably commented upon by the many marine engineers and officers of the United States Navy, as well as the officials of the exposition.

A bronze tablet of **H. S. Chase,** former president of the Chase companies, is soon to be placed in the companies' magnificent main office building in this city. The tablet, which shows a profile view of Mr. Chase, and which carries with it a tribute from the employees who worked under him, is being presented by the **Chase Foremen's Association.** Cass Gilbert, the celebrated New York architect, has charge of the designing and placing of the tablet. It is expected that the foremen's association will arrange a dedicatory program when the tablet is ready to be placed in position.

B. H. Devine, president of Devine Brothers' Company of Utica, N. Y., spoke at the meeting, presenting a paper on "The Metal Finishing Industry, Its Condition, Stagnation and the Remedy." The address was extremely technical but of particular importance to those interested in mechanical engineering. Mr. Devine pointed out the lack of standardization, the lack of consideration, the lack of information and the heterogeneous character of the metal finishing industry as a department of mechanical arts. He also touched upon the lack of progress in the development of tools and equipment on the part of factory owners, managers and engineers. The speaker said that in all his years of experience he had found that every avenue of the discussion of conditions led up to the fact that the absolute lack of information as to the practical and intelligent way to use glue was the restricting element in the whole work of the metal finishing industry. Accordingly he supplemented his remarks with a brief resume on the manufacture of glue and its application to metal finishing processes. In conclusion the speaker made the statement that the finishing side of the metal industry has been sadly neglected as compared to other branches of the industry and said that there was a great field in metal finishing work for mechanical engineers. As an illustration of the comparative neglect of metal finishing work Mr. Devine said that careful investigation would show that scarcely ever does a person employed in the finishing department of metal trades rise to a position of high importance in the business as a whole.—H. G. N.

TORRINGTON, CONN.

JUNE 1, 1921.

Figures compiled from official sources for the METAL INDUSTRY show that there are now only 4,524 workers employed in Torrington factories as against 7,473 employed when business was at its peak. In addition to this big curtailment in working force, factories are operating only fifty per cent of the time. Practically all salaries and wages have been cut; and a further cut is anticipated before the end of the Summer. More orders are beginning to be received but the orders for the most part are small and are barely sufficient to keep the plants working on short time with short force. So far as the general outlook is concerned there has been practically no change in the past month and there is no prospect of an immediate recovery. Optimists are hoping that the latter part of the Summer will see a resumption of activity, but there is nothing definite to indicate that this optimism is well founded. It is generally agreed, however, by those who are in touch with the situation, that when things finally do pick up, business will be better than at any time in the pre-war days, though it can not be expected that the phenomenal records of the war period will be equalled.

During the latter part of May the **Hendey Machine** plant increased its working hours, but this was to offset the shut-down from May 27 to June 6, and another shut-down later in the season for inventory and repair purposes.

M. W. Bartlett, formerly of Torrington, has been appointed general manager of the **Splitdorf Electrical Company** with headquarters in Newark, N. J.—J. H. T.

NEW BRITAIN, CONN.

JUNE 1, 1921.

With no signs of improvement in the metal manufacturing industries here, New Britain is about to open the summer months in the trough of one of the worst waves of industrial depression that has submerged local factories in years. Sales are falling away off, production has been greatly curtailed as a result, and, obviously, practically every concern is operating on a reduced schedule, both as to number of employees and the number of hours of work. Conversation with the heads of the various concerns shows no great optimism that the next few weeks, or even months, will bring about any greatly stimulated business.

The **North & Judd Manufacturing Company** is about the only local plant that has shown any indications of improvement at all. Here the foundry department has added one day a week to its working schedule and is now operating five days a week. The remainder of the factory is ranging anywhere from 32 to 55 hours per week. Since last month's review was published the **P. & F. Corbin Division** of the **American Hardware Corporation** has been compelled to go onto short time. This big plant now maintains a minimum schedule of 32 hours per week, with but very few departments working in excess of that time. The **Stanley Rule & Level Company** is continuing on its previously announced short time schedule but the various departments are being so aligned that the work available for the various employees has been evened up. This has resulted in a slight wage reduction. At **Landers, Frary & Clark's** the same thing is true. Business at this heretofore bustling concern is admittedly bad and attempts to push its vast line of cutlery, domestic hardware, electrical appliances, etc., are not resulting in the inrush of business that is desired. The plant is working on short time.—H. R. J.

ROME, N. Y.

JUNE 1, 1921.

Conditions in the brass and copper plants of this city have remained practically unchanged since last month's correspondence was published in the METAL INDUSTRY.

In an address before the Rotary Club of this city on May 26th, **P. C. Thomas,** president of the **Rome Manufacturing Company,** who started work there as office boy when the con-

cern was organized a little more than a quarter of a century ago, gave an exceptionally clear and interesting history of that concern's wonderful growth. The subject assigned to Mr. Thomas by the chairman of the entertainment committee was "My Business." He spoke in part as follows:

The buyer of today (if there be any such animal) occupies the same enviable position that the seller has occupied for the past few years, and believe me, he can find more legitimate excuses for not buying than the world has ever heard before. He has grown inordinately in stature almost over night, and in many instances treats us sellers with scant courtesy. The seller's shoe of 1920 is on the buyer's foot of 1921.—M. J. D.

PROVIDENCE, R. I.

JUNE 1, 1921.

It is believed that business depression among the metal trades has reached its lowest ebb and that while there may not be any rapid recovery, there will be a gradual and consistent one appreciable in a comparatively short time. The general depression in all the big manufacturing industries—textile, jewelry, rubber—have reflected upon the metal branches to a very considerable extent with the result that there have been more metal workers unemployed during the past few months than has been the case in more than five years.

The greatest consolation is in the fact that there is not an over-production in the metal branches in any line and that any improvement in the industrial lines must have its effect upon the metal branches. Textiles are already commencing to manifest an improvement that is said to be a permanent one, while the jewelry industry has encouraging evidences of an early return to activity.

A building trade strike involving all lines of building metal workers which has been going on for approximately a month, although the plumbers have been out for upwards of seven months, is on the eve of an amicable adjustment, which will unquestionably bring an improvement to those engaged in the structural metal branches.

As a tribute in recognition of his unusual record of sixty continuous years in the employ of the Rhode Island Tool Company, the anniversary of which he observed on May 2, **Robert F. Brown,** of 716 North Main street was on the evening of May 11 admitted as the first honorary member of the Foremen's Association of the concern at the organization's monthly meeting held at the Far East restaurant. The honor accorded Mr. Brown followed an appreciative tribute paid him on the anniversary occasion, when William C. Dart, president of the company, presented him on behalf of the concern a purse of gold.

The **Utility Novelty Company** is the name of a new concern that has been granted a charter under the laws of Rhode Island by Secretary of State J. Frederick Parker, for the purpose of manufacturing novelties of all kinds with a capital stock of $10,000. The concern will be located in Providence. The incorporators are Paul Shocker, George H. Holt and Duncan C. McKenzie.

The **A. H. Bliss Company, Inc.,** of this city has been granted a charter under the laws of Rhode Island by Secretary of State Parker for the purpose of dealing in jewelry. The capital stock is 250 shares without par value. The incorporators are Eugene P. Platt, David H. Butler and Frank H. Hammill.—W. H. M.

TRENTON, N. J.

JUNE 1, 1921.

Colonel Washington A. Roebling, first vice-president of the John A. Roebling's Sons Company, Trenton, N. J., celebrated his 84th birthday on May 26 by entertaining a number of relatives at dinner at his home, 191 West State street, Trenton. Colonel Roebling's health is excellent and he takes a keen interest in what is going on around him and in civic and national problems.

The situation in some of the Trenton metal plants is beginning to brighten up and better times are looked for. The plant of the **Ingersoll-Trenton Watch Company** has resumed operations after having been closed down for four weeks. A committee of creditors was appointed to obtain extensions of obligations amounting to more than $2,000,000 and provision made for the deposit of commercial bills with the National City Bank of New York. Resumption of the activities at the Trenton plant and at Waterbury, which has also started, is in part due to the efforts of this committee.

Conditions at the **Jordan L. Mott Company** plant have taken a turn for the worse and thirty hands were recently laid off. Those remaining at work are employed but a few hours each week.

The **Mercer Motors Company,** Trenton, N. J., which closed down its plant a short time ago, resumed operations on June 1. The officials announce that the working force of approximately 400 will be taken back as business warrants.

The **New Jersey Metal Refinishing Company,** Spring Lake, N. J., which began business eighteen months ago, has increased its facilities threefold and further enlargement is expected in the near future. The work of the company consists of polishing, buffing, plating, lacquering and oxidizing metals of every description.

The **Delaware and Atlantic Telegraph and Telephone Company** will shortly rebuild 200 miles of copper toll and exchange telephone lines near here and also underground cables in the Trenton district. The work will cost about $150,000 and will require considerable copper.

The **International Ring Manufacturing Company, Inc.,** of Newark, N. J., has been incorporated at Trenton with $100,000 capital to deal in jewelry. The incorporators are Nat M. Frutchman, Herman A. Sarwin and Emil Klein, of Newark.

M. W. Bartlett has been made general manager of the **Splitdorf Electrical Company,** with headquarters at the main factory at Newark. He was appointed recently by the board of directors. Mr. Bartlett joined the Splitdorf company in 1911 and remained with it until 1919, acting as secretary of the company for the last six years of association.

The **Pelletier Products Mfg. Company,** of Jersey City, N. J., has been chartered at Trenton with $500,000 capital by Alfred F. McCabe, of Jersey City, and others to manufacture automobile parts and equipment.

The **National Valve Company,** of Morristown, N. J., has been incorporated at Trenton with $100,000 capital to manufacture brass valves, etc. The incorporators are G. F. Lowe, James H. Samuel and Edward A. Quayle, Jr.

The **Brass Bed Refinish Company,** of 144 Parker street, Newark, N. J., was recently organized by Michael Monetto and others of Newark.

The **Radium Aluminum Manufacturing Company,** of 263 New York avenue, Newark, N. J., has been organized to manufacture utensils. Henry Heller, of 62 Bragow street, Newark, is one of the organizers.

The **Federal Light & Refining Company,** of Newark, N. J., has been incorporated with $200,000 capital by Clarence B. White, Montclair, N. J., James H. Krieck, Newark, N. J., Ambrose J. Walsh, Irvington, N. J.

Ampere Novelty Manufacturing Company, of 197 North Sixteenth street, East Orange, N. J., has been organized to manufacture metal specialties. W. P. Post, Jr., is one of the organizers.

William D. Zilsky will erect a factory at 263 New York avenue, Newark, N. J., for the manufacture of aluminum and other metal specialties.

The **Magna Metal Corporation,** of Newark, N. J., has been incorporated with $12,500 capital to manufacture metal products. Frank J. Connor and John H. Connor are the incorporators.

The **Mercer Welding Rods Company,** of Trenton, N. J., has been incorporated with $125,000 capital by Thomas Richmond, John J. Lawler and Harry Bernstein.

The **Reeves Manufacturing Company** has purchased a site on Passaic avenue, Newark, N. J., and will erect a plant for the manufacture of brass novelties and fixtures.

Interstate Smelting & Refining Company has purchased a plot of ground on Commercial avenue and will erect a plant.

J. Steinberg & Sons, of Newark, N. J., has been incorporated with $125,000 capital to deal in metal goods. The incorporators are Jacob Steinberg, Irving C. Steinberg and Louis J. Steinberg, all of Newark.

New Jersey Sanitary Street System, Inc. has been incorporated at Trenton with $100,000 capital to deal in metal street waste receptacles. The incorporators are Joseph J. Regan, Luke W. Delaney and Oswald R. Routh, all of Newark.

E. X. Electric Service Corporation, of Camden, N. J., has been incorporated at Trenton with $10,000 capital to deal in electrical supplies. The incorporators are William R. Abrahamson, Louis R. Abrahamson and William R. Doran, of Camden.

The **American Welding Company,** of 24 Kinney place, Newark, N. J., has been organized by A. R. Walling, of 278 Johnson avenue, Newark, N. J.

The **Brass, Bronze and Copper Company,** of Newark, N. J., has been organized to manufacture brass, bronze, etc. Irving N. Schafman, of 212 Elizabeth avenue, Newark, is one of the incorporators.—C. A. L.

BALTIMORE, MD.

JUNE 1, 1921.

The **Eastern Hardware and Supply Company,** recently incorporated with a capital stock of 5,000 shares, without stated par value, has been organized to take over the business of a number of concerns. The concerns involved are the Eastern Hardware and Supply Company of Baltimore, the Steel and Wire Products Company of Pittsburgh, and the Steel and Wire Products Company of Philadelphia. The president of the new company is Charles T. Farnen, of Baltimore, and the incorporators are James Clarke Murphy, Charles H. Schnepfe, Jr., and Edward H. Lange.

A new $100,000 dishwashing machine company, the **Williamson Products Company,** has been announced by George C. Smith, director of the Industrial Bureau of the Baltimore Board of Trade. The machine was invented by John S. Williamson, of this city, who is president of the concern, and is said to be a radical departure from those now on the market, being of the revolving brush type. About 10,000 feet of space is already occupied by the company at York road and Homeland avenue.

The **Baltimore Coppersmith Company,** Gustave Larsen president, is looking for a large factory building in Baltimore to provide space and facilities for the accommodation of its increasing business. When the Volstead Act put the distilleries and breweries out of business the greater part of the demand for special copper machinery and fixtures were cut off and hundreds of coppersmithing firms were under the necessity of being forced out of business, or seeking an entirely new class of work. The newly developing chemical and dye industries created a market for special copper containers and fixtures and the Baltimore Coppersmith Company entered the field as designers of such apparatus as well as manufacturers, which resulted in its securing government as well as private contracts.

The **Jones Hollow Ware Company** has installed an additional 24 horsepower motor, in four motor units, at its plant here. The plant has been remodeled in many other ways.

The **Central Metal Supply Company** has passed a resolution on the death of State Purchasing Agent Albert H. Wehr, which recently occurred. Mr. Wehr for many years was a director in this company.—W. J. L.

DETROIT, MICH.

All mail addressed to Detroit should be addressed to new house numbers. New directories, street number guides and information can be had from the publishers of the Detroit City Directory or a copy of a mailing list can be sent to them for correction.

INDIANAPOLIS, IND.

JUNE 1, 1921.

William Hendrickson, of Connersville, Ind., has assumed his work as deputy state factory inspector and was assigned to the eastern and southern districts. Legally the appointment would be made by the state industrial board, but Governor McCray made the selection and requested the board to place Hendrickson on the force. Hendrickson formerly was Fayette county sheriff.

A controlling interest in the **George S. Anderson Foundry Company,** in Jeffersonville, has been acquired by Henry Lang, who has been identified with the company since 1880, and a partner in the business since 1890. The Foundry Company is one of the oldest concerns in Jeffersonville.

Because of the inability of the employers and employees to reach an agreement in the wage scale, foundries in Columbus, Ind., are practically idle. The molders recently refused a 25 per cent. reduction and state they will accept nothing less than 75 cents an hour. Owners of foundries state, however, that much of the work about foundries could be done by unskilled labor, and that while the scale of 75 cents was not unreasonable for skilled workmen, they would not pay the rate to unskilled men.

The **Kokomo Brass Works,** at Kokomo, Ind., recently suffered a slight loss by fire when the roof of the foundry department was partially burned.

The **Columbus Foundry Company,** at Columbus, Ind., laid off their union molders May 2 and shut down their foundries, with the announcement that when the foundries are reopened they will be operated as "open shops." The wage contracts between the foundry companies and union molders expired May 1, and a short time ago the Columbus Foundry Company announced a wage reduction of 25 per cent. to union molders, which was rejected. Today the union molders proposed to the Columbus Foundry Company to accept a cut of 10 cents an hour, but the offer was rejected. The wage scale that expired May 1 was $7.20 a day.—E. B.

CLEVELAND, OHIO

JUNE 1, 1921.

There are several indications of a trend back to normal in the Cleveland metal industry. That conditions are getting back to lower wages, lower prices and steady work is indicated by the gradual resumption of metal working plants in the Cleveland district.

The **Parish & Bingham Company,** one of the conservative metal fabricators here announces that it is now working half time, the force now number 800. This firm makes automobile frames and other heavy metal parts.

The **Theodor Kundtz Company,** after a shutdown for a week opened with a full force of 1,200. While this is a woodworking plant, the fact that it makes sewing machine and phonograph cabinets and automobile bodies indicates that these trades requiring an equal value in steel machinery are getting back to production.

There is much speculation as to when and in what manner the new $3,000,000 plant of the **Fisher Ohio Body Company,** will be put into operation. The plant is a unit of the **General Motors Company,** which has recently announced that prices will be guaranteed for several months to come.

Cleveland automobile factories led all other industries in increase in employees during April, according to figures compiled by the Chamber of Commerce and the U. S. Department of Labor. Employees on the payrolls in this industry rose as follows:

January 31, 58,116; February 28, 59,786; March 31, 60,744; April 30, 61,847.—C. C. C.

LOUISVILLE, KY.

JUNE 1, 1921.

Business with the brass and copper working shops is quiet at the present time, there being very little demand for castings of any kind, or sheet metal work, and most of the shops are complaining right now. Present wage scales in the coppersmiths industry are so high as to force prices of material rather out of line according to some of the manufacturers.

The Kentucky Manufacturers Association recently sent out a questionnaire, twenty-one members answering. Five of these were employing as many men on February 1 of this year as last year, and all reported wage cuts. Others reported reduction in

output of from 5 to 98 per cent. and wage cuts of from 7½ to 33 per cent. The total number of employees this year was 7,292 as against 9,044 last year.

It is claimed that in general lines of industry operations are between fifty and sixty per cent. of what they were last year in tons, a few houses reporting 100 per cent., but very few, while a good many are doing 75 per cent.—A. W. W.

ST. LOUIS, MO.

JUNE 1, 1921.

The betterment of conditions generally is indicated in the renewed activity at the automobile factories in St. Louis. While the Buick units of the General Motors Company have been closed down and several hundred workmen laid off, the Chevrolet unit has opened after several months' idleness and some 300 workmen re-employed.

An increased activity in hardware is noted by local jobbing and manufacturing concerns which is bound to reflect in the brass molding lines. Several lines, including farm implements and apparatus, are beginning to recover from the slump of last Fall. Local molders expect slightly increasing volume of orders throughout the Summer months.

Among those who reported optimistically were the **More-Jones Brass and Metal Company,** and the **Superior Brass and Manufacturing Company.** Both concerns are able to keep a normal force at work.

The annual conference of the **American Zinc Institute,** which met in St. Louis, during the month, advocated an educational campaign to teach the various uses of zinc in manufactured articles, and described several new uses to which the metal is being put to counterbalance the present over-supply. Resolutions asking the treasury department to have the new two and one-half cent pieces coined of zinc were adopted and sent to Washington. The coinage in zinc is practiced economically in foreign countries, the delegates pointed out.

Platers in St. Louis are still operating on a restricted basis owing to slight manufacturing activities. Automobile accessories have shown a slight recovery, which is viewed as an encouraging sign. The **Musick Plating Works** report an increase in trade, as does the **St. Louis Plating Company.** Platers are buying more freely, according to the **St. Louis Platers Supply Company.**

Electrotypers have suffered a reduction in business through the printers' strike, but in view of the opening up of 30 of the larger plants on the open shop basis, conditions will quickly right themselves, it is believed. The **St. Louis Electrotyping Company** has installed a new Optimus plating machine with generator, which doubles its capacity.

Of the 18 stove and molding plants in Belleville, six have reopened during the month, after being closed several months. Polishers, finishers, shakerouts and laborers agreed to accept a 15 per cent. reduction in wages, making possible the resumption of operations, which would not have been resumed at the old scale of wages, it was said.

The **Buck Stove and Range Company,** of St. Louis, one of the five large stove plants here, has opened after six months' idleness and employs at present about 250 men. The normal force is 700.—W. G. R.

MONTREAL, CANADA

JUNE 1, 1921.

Conditions among the metal trades are certainly not what we should like to see, but on the whole there is a glimmer of hope. Some plants are running full time but others are not and, taking one with the other, there is no concealing the fact that there is room for improvement. Inquiry elicits the fact that everybody is making preparations for the good times which are to come but waiting for someone else to make the move.

With the opening of Summer considerable necessary public works are being started, and building of residential property has been progressing favorably. Conditions will gradually right themselves, as the indications now point that way.

The scrap metal dealers report slight increase in prices and demand for scrap and their stocks are beginning to move, compared with the past six months. Some of the dealers have suffered heavy losses owing to the bottom falling out of the high prices which prevailed until this heavy slump went into effect.

The **E. J. Woodison Company, Ltd.,** are now established in their new branch warehouse, 261 Wellington street W., Montreal, Quebec.

Royal Silver Plate Company, 48 Craig street West are busy on job plate work for hotels and restaurants. They have been largely in this line of work since January, 1921, after an advertising campaign for this line of business, which is now beginning to show results.—P. W. B.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The **L. J. Mueller Furnace Company,** 197 Reed street, Milwaukee, Wisc., have completed the erection of their new japanning building.

Barrett, Haentjens and Company, Hazelton, Pa., manufacturers of centrifugal pumps, are preparing plans for a one-story foundry addition.

Edgar I. Mills, 120 Liberty street, representative of European mills in iron, steel, copper, brass and aluminum, has removed to 44 Beaver street, New York.

The **Edro Richardson Brass Company,** 318 North Holliday street, Baltimore, Md., has plans under way for remodeling a building on Exeter street, which they intend to occupy.

Frank Motto and **Sam Purpera** have been found guilty of murdering W. C. Sly, and G. K. Fanner of the W. W. Sly Manufacturing Company, Cleveland, O., on December 31, 1920, and sentenced to electrocution.

The **Newark Stamping and Foundry Company,** Newark, Ohio, recently appointed George Glassmeier, foreman. This concern operates an aluminum foundry, grinding room, casting shop, and stamping and galvanizing departments.

Frank A. Scott and J. O. Eaton, receivers of the **Standard Parts Company,** Cleveland, Ohio, have issued a report outlining their operations and the results thereof, from the date of their appointment, September 1st, 1920 to February 28th, 1921.

A meeting of the creditors of the **Randall-Faichney Company, Inc.,** Boston, Mass., was held at the company's factory, No. 123 Health street, Roxbury, Mass., on Tuesday, May 31st. For information regarding the meeting address Alexander Whiteside, receiver.

A fire at the plant of the **Titan Metal Company,** Bellefonte, Pa., manufacturers of brass and bronze products, on April 29th, destroyed a number of buildings, with a loss estimated at $100,000. This company operates a brass machine shop and tool room.

The **Guyan Machine Shops,** Logan, W. Va., are planning for a new two-story machine shop, 60 x 100 ft., to replace a building recently destroyed by fire. This concern operates a brass, bronze and aluminum foundry, brass machine shop, brazing and soldering departments.

In order to centralize control of its business, the **Edward Valve Manufacturing Company,** have moved their general offices from 72 West Adams street, Chicago, Ill., to its factory at East Chicago, Ind. This company operates a brass, bronze and monel metal foundry.

One of the foundry buildings of the **Roman Bronze Works,** 275-289 Green street, Brooklyn, N. Y., was recently destroyed by fire. They are filing plans for the erection of a larger building of brick and steel construction with all modern facilities for foundry work, to be begun immediately.

The **Standard Underground Cable Company,** Perth Amboy, N. J., is considering the erection of a new plant at St. Louis, for the manufacture of its regular line of insulated wires and cables. A site has been selected. Headquarters of the company are in the Westinghouse Building, Pittsburgh.

The **Bethlehem Aircraft Corporation,** Bethlehem, Pa., has been incorporated with a capital of $25,000 to manufacture airplanes and parts, by E. Moore Robinson, who is treasurer and R. E. Wilbur, a director, both of Bethlehem. This concern operates brazing, soldering and japanning departments.

The **American Sanitary Manufacturing Company,** Abingdon, Ill., have increased their capital stock from $120,000 to $240,000. Additional buildings and equipment are being planned. This firm operates a brass foundry, brass machine shop, tool room, grinding room, stamping, soldering, plating and polishing departments.

The **Rome Wire Company,** have opened district sales offices at 50 Church street, New York City, to keep step with the expansion of their manufacturing facilities at their plants in Rome and Buffalo, N. Y. These offices will be in charge of Mr. H. S. Hammond, who has represented the company in the Eastern territory during the last twenty years.

The **Coale Muffler and Safety Valve Company,** Baltimore, Md., now operating at the plant of the Linthicum Bronze Foundry, 325 East Oliver street, which they recently took over, are planning for a number of enlargements to double, approximately, the present plant capacity. They operate a brass, bronze and aluminum foundry, and brass machine shop.

The Alemite Die Casting and Manufacturing Company have moved into their new plant at 2640-54 Belmont avenue, Chicago, Ill., containing 42,000 sq. ft. of floor space. They make die castings for musical instruments, talking machines, typewriters, carburetors, etc. They operate a brass machine shop, tool room, grinding room, casting shop and stamping department.

The **Bart Corporation,** 326 Sixth avenue, Newark, N. J., manufacturer of electric lamps, automobile reflectors and other metal products, has leased property at 82-88 Llewellyn avenue, Bloomfield, N. J., for the establishment of a new plant. The present works will be removed to this location. This company operates a grinding room, plating, polishing and lacquering departments.

The **Hauck Manufacturing Company,** of Brooklyn, N. Y., manufacturers of oil burners, oil forges, oil burning appliances, etc., have elected as their president, Mr. Henry T. Gerdes, mechanical engineer and manufacturer of New York; first vice-president, M. C. Hauck; second vice-president, A. B. Hauck; third vice-president, H. H. Kress; treasurer, A. H. Stein; secretary J. Lutz.

The **Witteman Aircraft Corporation,** Hasbrouck Heights, N. J., organized under Delaware laws, has filed notice of charter to operate a local plant for the manufacture of airplanes and parts. C. R. Witteman, of Teterboro, near Hasbrouck Heights, is president of the company. They operate a brass machine shop, tool room, grinding room, cutting-up shop, stamping, tinning, brazing, soldering, plating, polishing, japanning and lacquering departments.

The **Jenkins Manufacturing Company,** 20 Vesey street, New York, manufacturers of valves, brass goods, etc., have awarded a contract to Walter Kidde & Company, 90 West street, for a three-story addition, 50 x 80 ft., to its plant on Farrand street, Bloomfield, N. J., estimated to cost about $40,000. This firm operates a brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, soldering, plating, polishing, and lacquering departments.

The **Electric Service Supplies Company,** 17th and Cambria streets, Philadelphia, Pa., will act as exclusive selling agent for the Peerless Equipment Company of Hanover, Pa., manufacturers of Peerless Armature Repair Machinery and Segur Coil Winding Tools. Heretofore Peerless Armature Tools were manufactured by the Manley Manufacturing Company, York, Pa., and Segur Coil Winding Tools were manufactured by the Electrical Manufacturers Equipment Company, Chicago, Ill.

The **Picotte-Sennert Company, Inc.,** was founded on March 7th, 1921, with an office on West 42nd street, New York, but outgrowing their quarters had to locate in their more elaborate and larger quarters, 2521 Broadway. P. E. Picotte and A. C. Sennert have established a business along lines of their extensive experience, and formed a selling organization with a force of eleven salesmen. It is stated that these men can advise and remedy troubles that come up in manufacturing plants and pertain to their lines.

A fire at the plant of the **Motors Metal Manufacturing Company,** Milford avenue and Pere Marquette Railroad, Detroit, Mich., recently destroyed their shipping department, as well as storage warehouse and a frame building, that was used for the assembly of gasoline tanks. The tank and shipping department have been transferred to a new steel building 80 x 156 feet, which was erected some time ago, and the portion of the wooden structure, that was a part of the main plant will be speedily rebuilt.

Judge John M. Killets of the District Court of the United States for the Eastern district of Michigan, Southern division, handed down a decree on March 18, completely sustaining patent No. 1,034,954, held by the **Dallas Brass and Copper Company,** Chicago, Ill., on their lock seam tube forming machine, in their suit against the Motor Products Corporation and Diamond Manufacturing Company, of Detroit. Tubing made on these machines is principally used in the radiators of automobiles, about 75 per cent of the radiators made being constructed of this type of tube.

The Instant Wonder Heater Company, Neenah, Wisc., has been reorganized following the resignation of A. T. Archibald as president and general manager. He is succeeded by A. B. Jensch as president and O. W. McCarthy as general manager and assistant treasurer. The other officers are: Vice-president, Christian Walter; secretary, J. B. Langenberg; treasurer, Herbert Koske, Gillett, Wis. The company manufactures patented bottles and other containers with heat-retaining qualities. They operate a cutting-up shop, soldering, plating, and polishing departments.

The **American Metal Products Company,** 671 Kinnickinnic avenue, Milwaukee, manufacturer of bronze, brass and alloy metals by patented formulae, will proceed with the construction and equipment of a new foundry and machine shop at Fifty-third avenue and Burnham street, to cost about $75,000. The general contract has been let to the Worden-Allen Company, Milwaukee. Carl J. Zaiser is secretary-treasurer and general manager. They operate a brass, bronze and aluminum foundry and a grinding room. They are in the market for screw machines, ingot copper, nichrome steel scrap and pure aluminum.

The Rosenband Manufacturing Company, 22 Green street, Newark, N. J., manufacturers of brass and other metal specialties, have acquired a number of buildings at Dickerson and Hecker streets, heretofore held by the Redman Manufacturing Company. The new owner will occupy the plant, and proposes considerable increased capacity over the present works. The Redman Company specializes in the manufacture of hardware and artisans' tools, and is now occupying a new plant at Hilton, N. J., recently completed. The Rosenband Company operate a tool room, cutting-up shop, stamping, soldering, plating, polishing and lacquering departments.

The **General Electric Company,** Schenectady, N. Y., is preparing plans for the erection of a new plant at New Albany, Indiana, for the manufacturing of incandescent lamps. The company will also proceed at an early date with the construction of an addition to the plant of the Fort Wayne Electric Works, on a site of 60 acres, recently acquired. A new distributing plant will be established at Syracuse, N. Y. The Canadian General Electric Company, a subsidiary organization, has called a special meeting of stockholders on June 15, to increase its capitalization from $11,000,000 to $20,000,000, a portion of the proceeds to be used for expansion. They operate the following departments: brass foundry, brass machine shop, tool room, casting-shop, brazing, soldering, polishing, japanning and lacquering.

HELPING THE ZINC INDUSTRY

Secretary Hoover conferred with the representatives of the American Zinc Institute April 14, 1921, with a view to overcoming the present depression. Foreign competition has become very serious; Mr. Hoover, calling the zinc industry a "key industry," stated that it should be encouraged.

TRADE PUBLICATIONS

Research Narrative No. 9. The Centrifugal Creamer. A folder issued by the Engineering Foundation, 29 West 39th street, New York.

Doorways. A catalogue issued by the Richards-Wilcox Manufacturing Company, Aurora, Ill., describing their sliding door equipment.

Baird Machinery. A pamphlet issued by the Baird Machine Company, Bridgeport, Conn., describing tumbling barrels, and other machinery which they manufacture.

Moroloy—Silver Nickel Motor Bearings. A folder issued by the Standard Metal Products Company, Los Angeles, Calif., containing a price list of their motor bearings.

Reilly Evaporator. Bulletin No. 330. A catalog issued by the Griscom-Rusell Company, 90 West street, New York City, describing the Reilly evaporators for marine service.

Core Making. Bulletin No. 13, issued by the Foundry Equipment Manufacturers' Association, discussing the use of various sands in core making and other important points.

Principles and Policies of the United States Steel Corporation. A statement made by Elbert H. Gary, chairman board of directors, at the annual meeting of stockholders, April 18, 1921.

Nagel Motor List, No. 30. A booklet issued by the W. G. Nagel Electric Company, 28 St. Clair street, Toledo, Ohio, listing new and remanufactured motors and generators.

Jobbing Solder. A booklet issued by Marks Lissberger & Son, Inc., Long Island City, N. Y., containing a paper on "What Is the Most Economical Method of Distributing Solder," by Milton L. Lissberger.

Hauck Oil Burners, Torches and Furnaces. A booklet issued by the Hauck Burner Service Station, 1718 Sansom street, Philadelphia, Pa., describing the Hauck kerosene burning torches, heaters, portable furnaces, burners and forges.

Vanadium. A finely printed and illustrated catalog issued by the Vanadium Corporation of America, giving the history and sources of vanadium, and the applications of vanadium steels in armaments, locomotives, automobiles, airplanes and machinery, etc.

Nikolas Lacquers, Enamels, Bronzes. A nicely printed catalog issued by the G. J. Nikolas Company, 1227 West Van Buren street, Chicago, Ill., describing various lacquers and enamels for metal and other materials and their uses, and their lacquering equipment.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$500	$600
American Brass	100	165	170
American Hardware Corp.	100	...	140
Bristol Brass	25	15	20
International Nickel, com.	25	14⅞	15¼
International Nickel, pfd.	100	82	90
International Silver, com.	100	30	...
International Silver, pfd.	100	90	94
New Jersey Zinc	100	125	128
Rome Brass & Copper	100	110	130
Scoville Mfg. Co.	100	325	350
Yale & Towne Mfg. Co.	...	245	255

Corrected by J. K. Rice, Jr., & Co., 36 Wall Street, New York.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE

JUNE 1, 1921.

COPPER

The stronger and more confident feeling prevailing at the end of April and during the first three weeks of May was expressed in an advance in prices of copper ranging from ½ to 1 cent per pound. There was a reaction in the last few days, bringing about a decline of from ⅛ to ¼ cents from the highest levels in both the major and outside markets. Lake copper, delivered, was relatively less strong than electrolytic, rising from 12.75 cents at the end of April to 13.25 cents at the end of May. Electrolytic advanced from 12.50 cents f. o. b. refinery at the beginning of May to 13.25 cents May 27, but reacted to 13.12½ cents May 31. Casting copper, which was offered as low as 11.62½ cents refinery at beginning of May, sold as high as 12.62½ cents but reacted May 31, to 12.50 cents, producers' works, all for nearby shipments. Electrolytic for future delivery—July and third quarter positions—advanced ½ to ¾ cents per pound from 12.75 to 13.50 cents for July and from 13 to 13.75 cents for third quarter. Producers' prices advanced from 12.62½ cents delivered prompt and 12.75 cents for June, to 13.50 cents delivered for prompt and June but reacted fractionally on last day of May.

The advance was largely due to the improved statistical position and the increased interest of foreign buyers, but the advance in sterling exchange was also a very important factor, sales being made as high as 13.75 cents delivered Hamburg for electrolytic. The reaction was due mainly to the break in foreign exchange which resulted from preparations made by Germany to satisfy reparations claims. Domestic consumers while very conservative, made some purchases on the rising market. Total sales during the month were probably not far from 100,000,000 pounds and deliveries into domestic and foreign consumption are estimated about 95,000,000 pounds, including 35,000,000 pounds for export. Production of refined copper from domestic and foreign material was estimated 75,000,00 to 80,000,000 pounds indicating that stocks were reduced about 20,000,000 pounds. One of the most interesting new developments was the formulating of a new and broad contract for trading in standard copper on the New York Metal Exchange, transactions to begin June 1. London operators were much concerned, fearing that the London market would lose its supremacy to New York in international trading copper.

TIN

Fluctuations in prices of spot tin during May were less violent than sometimes, covering a range of 1.87½ cents per pound from the lowest level, May 3, Straits 31.62½ cents, American pure 31.37½ cents and 99 per cent. metal 30.25 cents to the highest level May 20, Straits 33.50 cents, American pure 33.12½ cents and 99 per cent. tin 32.37½ cents. The opening, Straits 31.87½ cents, American pure 31.50 and 99 per cent. metal 39.50 cents was at a decline of ⅛ cent from the April closing, on both Straits and 99 per cent. tin but showed an advance of ¼ cent on American pure. Statistics for April—as was also true in March—revealed unusually small deliveries into American consumption while stocks in store and landing were large, 2,441 tons—a discouraging feature to London sellers. By the end of first week, however, sentiment changed upon renewed American small purchases, and prices were up 1 cent per pound. Consumptive buying was lacking and a decline was inevitable. In second fortnight, speculative demand became prominent, carrying prices to the highest level, after which the low rates on sterling exchange became a factor in depressing prices, which carried Straits to 31.62½ cents, American pure 31.25 cents and 99 per cent. tin 30.50 cents, May 31.

LEAD

The leading lead interest advanced its basis of prices twice during first fortnight, a total of ½ cent per pound from 4.50 cents at the beginning of the month to 4.75 cents May 4, and again May 11, to 5.00 cents per pound, East St. Louis and New York. Outside prices May 1 were 4.60 cents East St. Louis, 4.75 cents New York and advanced almost daily until May 11, when East St. Louis was 5.00 cents, New York 5.25 cents per pound, the market being strong under active demand. By beginning of second fortnight, there having been a decline in London prices, the domestic market was quieter and prices were off to 4.95 cents East St. Louis, 5.15 cents New York. The market being dull in the meantime, the decline was continued to 4.75 cents East St. Louis, 5.00 cents New York on May 24, there being no further change May 30 in New York, but with East St. Louis being shaded to 4.70@4.75 cents. The break in sterling exchange rates (12 cents in ten days), and the lower

London prices by this time, had brought the possibility of foreign competition again into prominence.

ZINC

The May zinc market, after the April closing, 5.00@5.50 cents per pound for prime Western prompt metal in East St. Louis and New York, respectively, opened at a five point decline, the market having become quiet. On May 10, there being no change in the meantime in the limited operations of the entire industry—output and consumption both being considered—prices were again marked off five points. A disquieting effect was produced by the efforts of German interests to re-establish world control of the non-ferrous metals, more particularly of zinc, which was pointed out by the Zinc Institute. The Emergency Tariff bill, under consideration at this time (now become a law), will practically exclude German zinc through its exchange rate provision, by which imports will be figured on not less than one-third "normal" or pre-war average, until such time as the permanent tariff bill is put through. By beginning of second fortnight, the market still remaining dull, producers, in the effort to effect sales, shaded prices another five points. Sheet zinc also was reduced to a 10 cent basis on May 17. With no improvement in conditions over the remainder of the month, the decline in prices was continued to 4.70@4.75 cents East St. Louis, 5.20@5.25 cents New York, indicating a net decline of 30 points.

ALUMINUM

The Aluminum Co.'s schedule of prices was unchanged throughout May, 15-ton lots, f. o. b. producer's plant being merely nominal at 28.50 cents for 99 per cent. and purer; 28 cents for virgin 98-99 per cent.; 27.30 cents for No. 12 alloy and 42.60 cents for sheet 18ga. Outside market prices, after holding firm at the April closing, under fair demand during first fortnight, were shaded when the market turned quiet. May 19, quotations were marked off ½ cent per pound to 22.50@23.00 cents for 98-99 per cent. virgin, 20.00@20.50 cents for 98-99 per cent. remelted, and to 18.00@19.00 cents for No. 12 remelted. The market at the close was dull and unsettled, with shipments from abroad freely offered at 22@23 cents f. o. b. New York for delivery over the remainder of 1921, subject to any changes in duty from the passage of the Emergency Tariff—details of which have not yet become available.

ANTIMONY

After fair demand during first fortnight at unchanged April prices for spot carloads, the antimony market turned quiet, quotations remaining unchanged, 5.25 cents duty paid New York for carloads throughout the month. Parcels afloat, however, could be purchased for ⅛ cent per pound less than spot. Import prices for Summer shipments from the Orient were irregular.

SILVER

Fluctuations in prices of bar silver of foreign origin during May ranged from 62½ cents, the highest level of the month on May 9, to 57½ cents, the lowest level on May 31, covering a total of 5 cents per ounce. The opening was made at 61⅜ cents, an advance of ½ cent over the April closing. Domestic bars, throughout the month were quoted at 99¼ cents per ounce. Silver purchased for the Denver Mint during the month amounted to 1,152,000 ounces and for the San Francisco Mint, 400,000 ounces. Total purchases acquired by the Government under the Pittman act on May 17 amounted to 53,870,197 ounces.

QUICKSILVER

Fluctuations in quicksilver prices during May covered a range of $2 per flask of 75 pounds each, from $46@47 at the beginning of the month to $47@48 May 9, declining to $46.50@47 May 17, and then advancing to $48 on May 20, there being no further change at the close.

PLATINUM

Platinum prices were unchanged during May at the April closing $72@73 per Troy ounce for pure. The market was dull.

OLD METALS

The old metals trade at the beginning of May was in a waiting attitude, which by end of first fortnight had developed into a decidedly better feeling, due to the increased purchases made for export. In third week, prices were advancing fractionally, the demand for copper being in the lead. Aluminum scraps, however, which previously had been in fair demand, turned quiet. During fourth week, demand was even better with advances on nearly the entire list of items. Pure tin foil was up 2 cents to 18 cents, block tin pipe 1 cent to 24 cents and uncrucibled copper 1 cent to 9.75 cents. Light copper ⅝ cents to 8.75 cents. ½ cent advances, each, were made on strictly crucibled copper to 10.50 cents; new brass clippings to 6 cents; clean aluminum turnings to 5.50 cents; aluminum clippings to 13 cents and old sheet to 10.50 cents; heavy lead to 4.25 cents and tea lead to 3 cents; also, electrotype dross to 4.25 cents, stereotype to 4.50 cents and stereotype dross to 2.25 cents. ¼ cent advances were numerous, and the only declines for the month were ¼ cent on new zinc to 3.25 cents and ⅛ cent on old zinc to 2.50 cents.

MAY MOVEMENTS IN METALS

	Highest	Lowest	Average
Copper:			
Lake	13.25	12.75	13.119
Electrolytic	13.12½	12.50	12.833
Casting	12.62½	11.62½	12.238
Tin	33.50	31.62½	32.523
Lead	5.30	4.80	5.082
Zinc (brass special) St. Louis	5.10	4.82½	4.998
Antimony	5.25	5.25	5.25
Aluminum	23.50	22.50	23.06
Quicksilver (per flask)	48.00	46.00	47.214
Silver (cts. per oz.) Foreign	62.50	57.50	59.85

WATERBURY AVERAGE

Lake Copper.—Average for 1920, 18.06—January, 1921, 13.75—February, 13.50—March, 12.625—April, 12.75—May, 13.125.

Brass Mill Zinc—Average for 1920, 8.33—January, 1921, 6.05—February, 5.50—March, 5.25—April, 5.20—May, 5.30.

Metal Prices, June 6, 1921

NEW METALS

Open Market

	Cents
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Electrolytic, carload lots, delivered	13¼
Lake, carload lots, delivered	13¼
Casting, carload lots, delivered	12½
TIN—Duty free.	
Straits, carload lots	31⅝
LEAD—Duty, Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	5.05
ZINC—Duty 15%.	
Brass Special	5.30
Prime Western, carload lots	5.30
ALUMINUM—Duty, Crude, 2c. per lb. Bales, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	....
100-lb. f. o. b. factory	....
Ton lots, f. o. b. factory	23-28½
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot.	5.25
NICKEL—Duty, Ingot, 10% ad valorem. Sheet, strip, strip and wire, 20%.	
Ingot	41.00
Shot	41.00
Electrolytic	44.00
MANGANESE METAL—95-98% Mn., carbon free, per lb. Mn. contained	0.75
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.25–$1.35
BISMUTH—Duty free	1.59
CADMIUM—Duty free	1.40
CHROMIUM METAL—95-98% Cr., per lb. Cr. contained	1.50
COBALT—97% pure ..... Nominal	4.00
QUICKSILVER—Duty 10% per flask of 75 pounds	47-48
PLATINUM—Duty free, per ounce	72.00-75.00
SILVER—Government assay—Duty free, per ounce	.99¼
GOLD—Duty free, per ounce	20.67

Metal Prices, June 6, 1921

INGOT METALS

Silicon Copper, 10%	according	to	quantity	36	to42
Phosphor Copper, guaranteed 15%	"	"	"	18	to30
Phosphor Copper, guaranteed 10%	"	"	"	17	to29
Manganese Copper, 30%	"	"	"	46	to56
Phosphor Tin, guarantee 5%	"	"	"	40½	to50½
Phosphor Tin, no guarantee	"	"	"	37	to50
Brass Ingot, Yellow	"	"	"	9	to12
Brass Ingots, Red	"	"	"	12½	to15
Bronze Ingot	"	"	"	14	to17
Parsons Manganese Bronze Ingots	"	"	"	17½	to19
Manganese Bronze Castings	"	"	"	27	to36
Manganese Bronze Ingots	"	"	"	13	to16
Manganese Bronze Forgings	"	"	"	30	to40
Phosphor Bronze	"	"	"	24	to30
Casting Aluminum Alloys	"	"	"	18	to25
Monel Metal	"	"	"	38	

OLD METALS

Buying Prices		Selling Prices
9½to 9¾	Heavy Cut Copper	11 to12
8½to 9	Copper Wire	10 to11
7½to 8	Light Copper	9 to 9½
9½to10	Heavy Machine Comp	11½to12
6 to 6¼	Heavy Brass	8 to 8½
4 to 4½	Light Brass	6 to 6½
5 to 5½	No. 1 Yellow Brass Turnings	6½to 7
8½to 9	No. 1 Comp. Turnings	10 to10½
3½	Heavy Lead	4
3½	Zinc Scrap	4
6½to 9½	Scrap Aluminum, Turnings	7½to10½
15½to17½	Scrap Aluminum, cast alloyed	18.00to19.50
18.50	Scrap Aluminum, sheet (new)	21.00
25.50	No. 1 Pewter	29.50
14½	Old Nickel anodes	16½
22½to24½	Old Nickel	26½to28½

BRASS MATERIAL—MILL SHIPMENTS

In effect May 18, 1921,

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.16¼	$0.17¾	$0.19
Wire	.17¼	.18¾	.20
Rod	.14¼	.18¾	.20
Brazed tubing	.27½	...	.32¼
Open seam tubing	.27½	...	.32¼
Angles and channels	.32½	...	.37¼

To customers who buy less than 5,000 lbs. in one order.

	High Brass.	Low Brass.	Bronze.
	Net base per lb.		
Sheet	$0.17½	$0.19	$0.20¼
Wire	.18½	.20	.21¼
Rod	.15½	.20	.21¼
Brazed tubing	.28¾	...	.33½
Open seam tubing	.28¾	...	.33½
Angles and channels	.33¾	...	.38½

SEAMLESS TUBING

Brass, 20c. to 21c. per lb. base.
Copper, 22c. to 23c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	18¾c. net base
Muntz of Yellow Metal Sheathing (14"x48")	16¼c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	17¼c. " "
Muntz or Yellow Metal Rod	14¼c. " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	21¼c.-23½c. net base
From stock	23¾c.-26c. net base

BARE COPPER WIRE—CARLOAD LOTS

15¾c. to 16¾c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	22c. per lb. base
100 lbs. to 300 lbs. in one order	23c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 10c. basis less 8 per cent. discount.

Casks, jobbers' prices	11½-12½c.
Open casks, jobbers' prices	12 -13c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	42½c.
Aluminum coils, 24 ga. and heavier, base price	37½c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10%	Quality	28¾c. per lb.
15%	"	31¼c. " "
18%	"	32¼c. " "

Nickel Silver Wire and Rod

10%	Quality	31c. per lb.
15%	"	35¼c. " "
18%	"	38c. " "

MONEL METAL

Shot	35
Blocks	35
Sheet Bars	40
Hot Rolled Rods (base)	42
Cold Drawn Rods (base)	56
Hot Rolled Sheets (base)	55

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25s. over. Above prices f. o. b. mill.

Lead Foil—base price—figured on base price of lead at the time.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 61c. to 63c. per Troy ounce, depending upon quantity.

Rolled sterling silver, 60c. to 63c.

NICKEL ANODES

85 to 87% purity	.50c. per lb.
90 to 92% "	.52½c. per lb.
95 to 97% "	.55c. per lb.

Supply Prices, June 6, 1921

CHEMICALS

In Commercial Quantities

Acid—		
Boric (Boracic) Crystals	lb.	.15-.17
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02½
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg. Carboys	lb.	.07½
Nitric, 42 deg. Carboys	lb.	.07¾
Sulphuric, 66 deg., Carboys	lb.	.02½
Alcohol—		
Denatured	gal.	.65
Alum—		
Lump, Barrels	lb.	.05
Powdered, Barrels	lb.	.06
Aluminum sulphate, commercial tech	lb.	.03-.04
Aluminum chloride solution	lb.	.20
Ammonium—		
Sulphate, tech., Barrels	lb.	.04
Sulphocyanide	lb.	.75
Argols, white, see Cream of Tartar	lb.	.75
Arsenic, white, Kegs	lb.	.08½
Asphaltum	lb.	.35
Benzol, pure	gal.	.45
Blue Vitrol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.06½
Calcium Carbonate (Precipitated Chalk)	lb.	.07
Carbon Bisulphide, Drums	lb.	.08
Chrome Green	lb.	.40-.45
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.48
Carbonate, Barrels	lb.	.22
Cyanide	lb.	.63
Sulphate, Barrels	lb.	.06½
Copperas (Iron Sulphate, bbl.)	lb.	.02½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.32
Crocus	lb.	.15
Dextrin	lb.	.08-.10
Emery Flour	lb.	.07
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	3.25
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl.	lb.	.02½
Lead Acetate (Sugar of Lead)	lb.	.11-.12
Yellow Oxide (Litharge)	lb.	.09
Mercury Bichloride (Corrosive Sublimate)	lb.	.85
Nickel—		
Carbonate Dry	lb.	.50-.55
Chloride, 100 lb. lots	lb.	.30-.40
Salts, single, bbls	lb.	.12-.13
Salts, double, bbl	lb.	.14-.15
Paraffin	lb.	.07-.10
Phosphorus—Duty free, according to quantity		.30-.35
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	.07
Electrolytic, 70-75% fused	lb.	.10
Potassium Bichromate, casks	lb.	.14
Carbonate, 80-85%, casks	lb.	.07
Cyanide, 100 lb. drums, 93-94%	lb.	.60
Pumice, ground, bbls	lb.	.05
Quartz, powdered	ton	—
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.40
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.07½
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.39
Soda Ash, 58%, bbls	lb.	.03
Sodium—		
Biborate, see Borax, bbls	lb.	.06½
Bisulphite, tech. bbls	lb.	.05¾
Cyanide, 96 to 98%, 100 lbs	lb.	.28-.30
Hydrate (Caustic Soda) bbls	lb.	.05½
Hyposulphite, kegs	lb.	.05
Nitrate, tech. bbls	lb.	.04½
Phosphate, tech., bbls	lb.	.06
Silicate (Water Glass) bbls	lb.	.03
Sulpho Cyanide	lb.	.65
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.11-.12
Sulphur (Brimstone) bbls	lb.	.03
Tin Chloride	lb.	.40
Tripoli	lb.	.03½
Verdigris, see Copper Acetate	lb.	.48
Water Glass, see Sodium Silicate, bbls	lb.	.03
Wax—		
Bees, white ref. bleached	lb.	.70
Yellow, No. 1	lb.	.30
Whiting, Bolted	lb.	.03-.06
Zinc, Carbonate, bbls.	lb.	.20
Chloride, 600 lb. lots	lb.	.10-.12
Cyanide	lb.	.46
Sulphate, bbls.	lb.	.03½

COTTON BUFFS

Open buffs, per 100 sections (nominal).		
12 inch, 20 ply, 64/68, cloth	base,	$30.69
14 " 20 " 64/68, "	"	38.17
12 " 20 " 84/92, "	"	45.85
14 " 20 " 84/92, "	"	61.75
Sewed buffs, per pound		
Bleached and unbleached	"	.45

FELT WHEELS

		Price Per Lb. 100 to 300 Lbs.	Price Per Lb. Less Than 100 Lbs.
White Spanish—			
Diameter— 6" to over 16"	½" and ¾"	$3.90	$4.00
" 6" to 8"	1" to 3"	3.00	3.10
" 10" to 16"	1" to 3"	2.90	3.00
" over 16"	1" to 3"	3.00	3.10
" 6" to over 16"	over 3"	3.30	3.40
Grey Mexican or French Grey—			
Diameter— 6" to over 16"	½" and ¾"	$3.80	$3.90
" 6" to 8"	1" to 3"	2.90	3.00
" 10" to 16"	1" to 3"	2.80	2.90
" over 16"	1" to 3"	2.90	3.00
" 6" to over 16"	over 3"	3.20	3.30

Above are even diameters. Odd diameters 50c. advance.